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Electrical World

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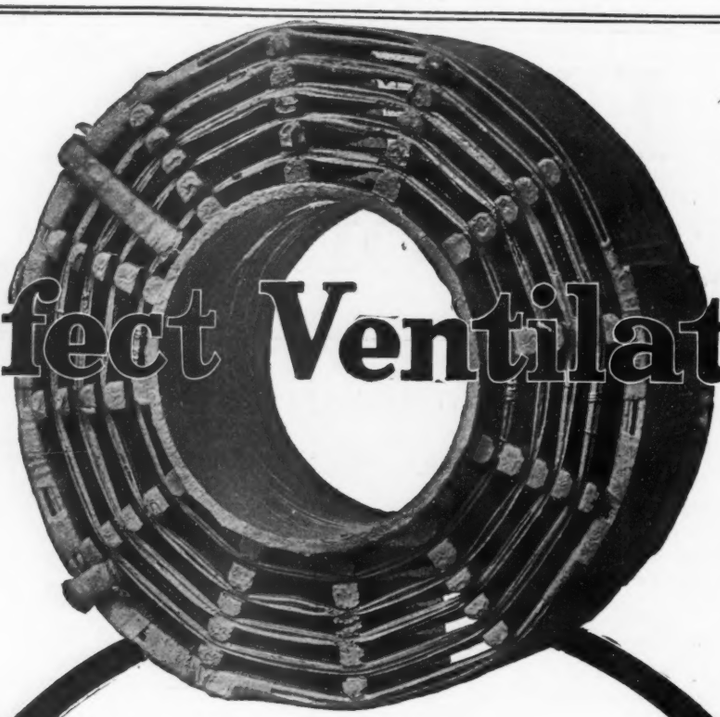

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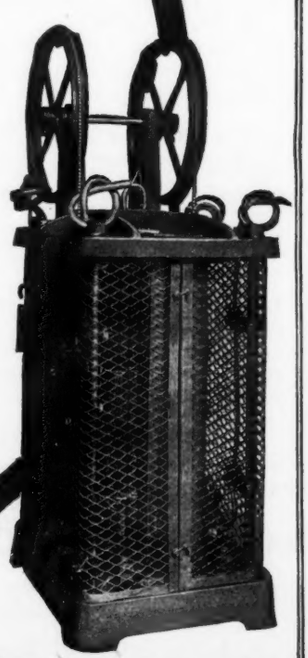

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Electrical World

The consolidation of ELECTRICAL WORLD, ELECTRICAL ENGINEER *and* AMERICAN ELECTRICIAN

Volume 72 New York, Saturday, November 9, 1918 *Number* 19

Concerning Intersociety Memberships

ONE of the ways by which central-station people can learn about the electrochemical industry is by taking out memberships in the Electrochemical Society. That is what the Ohio Electric Light Association has done as a body. One well-qualified member will attend meetings, dissect reports and addresses and disseminate information to members of the Ohio association in general. He will become a valuable connecting link between the two industries. Too much approbation for its action in this matter cannot be accorded the Ohio Electric Light Association. It has shown an appreciation of the importance to the central station of the electrochemical field. It has grasped an open opportunity to get first-hand, uncolored information about its own relation to electrochemical concerns, and it has pointed the way to other groups of electrical men who desire more accurate knowledge of basic facts in this kindred industry. It is to be hoped that the example thus set will be followed by other associations and societies, not only in seeking facts about electrochemistry but also in other industries related to the electrical business.

A little less emphasis on man power, a little more emphasis on woman power would represent the facts as they are in the industry to-day. Some of the men who will return home after their patriotic work for humanity won't want their old jobs; they will expect and receive better jobs either with the old company or in another place. And the inexhaustible possibilities for upbuilding in the electrical industry will require more and more human power in order that they may be realized to the full. Women will be in industry in greater numerical strength than ever before.

Announcement to Readers

AFTER Jan. 1, 1919, the subscription price of the ELECTRICAL WORLD will be five dollars a year, as announced in the colored insert in the preceding pages.

It is a difficult task for a journal to express its approval of its own ideals of service to an industry of which it is a part. Had not these ideals of service and their carrying out been recognized many times by our readers in their letters to the editors, such an expression might seem out of place. The ELECTRICAL WORLD has always endeavored to be the journal with which others are compared. It has sought to be truly representative of the best engineering and business thought of the industry. In each critical period in the development of the industry it has sought to find the constructive plan that would lead the industry forward. All the time it has planned its articles and editorials to be practical and helpful to the men who were at work, whether as engineers, as central-station men, as manufacturers or as business men of the industry. The answer as to whether it has been of service is found in the fact that both at home and abroad the ELECTRICAL WORLD has a position of leadership for which its editors feel a very real responsibility, and that its subscribers, found in all countries, are literally the "who's who" of the industry.

The cost of rendering this service has been increasing. Within the past few months costs have increased enormously. The postage cost alone of mailing the ELECTRICAL WORLD to each subscriber plus the cost of the blank paper is now nearly double the present subscription price, and the zone system of postage will, unless it is repealed, increase the postage element in this cost 83 per cent for each of two succeeding years. Other costs have risen and are rising proportionately.

The ELECTRICAL WORLD never had a greater opportunity for service to its subscribers. The whole industrial world is being remade. Cost what it may, this service must be continued, and the editors look forward to meeting these opportunities for service, knowing that they will not lack either the moral or the financial support of the industry.

The general effects of curtailment in building construction which have been felt by electrical contractors for some time are now beginning to make themselves known to electrical supply jobbers. Complaint is made that the turnover is not so rapid as it was, and profits are therefore not so great. The alternative, of course, is to increase prices or cut down expenses, with a natural inclination to do the former. However, raising prices does not always bring relief, and if electrical supply jobbers will trim their overhead in proportion to their lessening turnover, they will find themselves better able to cope with existing and after-war conditions.

Clean Men for the Work of the World

THE war is not over. Our industries have just contributed to a huge Liberty loan to help bring that war to a successful conclusion. We have invested our money in equipment for our soldiers. We are now asked to give our money for the upbuilding of the morale of that army. No war has ever been fought with an army so clean as the one America has sent to the

Old World. General Pershing has said that every hut adds ten men to a quota of one hundred.

The task of upholding the morale of the army should peace be declared to-morrow would be even greater than during the war. Under the inspiration of patriotic purpose men forget their petty vices and put into their work the enthusiasm and the self-sacrificing spirit that comes from high ideals. It is human after a great crisis to let down. Should peace be declared to-morrow it would be human for men to let down. If our men and boys are to come back fit for the work of the world which will face them on their return, if they are to take a vital part in the tremendous tasks of reconstruction which face us in this country after the war, they must come back clean and whole; they must come back with the same moral courage to meet the problems of commercial life that they have learned counts for so much in military life.

To state these self-evident facts is simply to state the fundamental value of pushing this campaign for united war work to a successful conclusion. Presidents and generals, business men and soldiers have only words of commendation for what has been accomplished. May each individual take to himself a part of the moral responsibility of the world and see that he does his part in the drive that starts on Nov. 11.

The electric power shortage in industrial centers has become worse with the shifting back of the clock to standard time. Of course, the utilities will, by cutting out circuits here and there, by overloading equipment and by sundry other expedients, manage to pull through the winter somehow or other. But without power production suffers, and production is what the country is most in need of right now. Moreover, the sad part of the situation is that the power shortage is most acute in war industry centers. We spend billions for equipping our army, but apparently do not seem to be able to raise any enthusiasm for an emergency power act which will make the steady flow of munitions to that army possible.

Overhauling and Improving Equipment

ONE does not at first think of a hydroelectric system as a natural point for inculcating fuel economy, but J. W. Andree's brief account of the California situation will quickly demonstrate the importance of the subject. In fact, there is a double chance for saving fuel in the auxiliaries of a water-power plant—first, by lessening the general need for fuel by improving the hydraulic system; second, through more efficient use of the coal or oil. Thus, on the system of the Southern California Edison Company both these remedial measures have been most successfully applied. On the hydraulic side the pipe lines have been cleared, the losses of water curtailed in every possible way, and the waterwheel plants overhauled. In particular, nozzles and valves have been brought up to date, and some changes of generators are to be made in the interest of increased efficiency. On the steam end of the equipment the big turbine at the Long Beach station is being thoroughly gone over and put in shape even to the least auxiliary, and there is here in prospect a gain of 10 per cent in efficiency. In another of the plants one-third of the boilers have been fitted for burning natural gas, with auxiliary oil burners to serve if the gas temporarily fails. The entire boiler plant, in fact, has had close attention and has been made ready to get at the winter's work in the best possible condition. It is the small details of improvement that count in a well-ordered plant; the big ones have already been taken care of. But the small items add up to a figure that is often far from negligible in the balance sheet.

Plans for economic reconstruction in the European countries, so far as the supply of electrical power for industry is concerned, center largely upon "super power stations." Our own statesmen in Washington have something oratorical to express now and then upon the advantage of building such giant industrial energizers in this country. Yet the industry here only modestly says to the whole world: "We originated and developed to success the great central station which conserves fuel, conserves human power and cheapens the cost of energy. Our basic principles are open for study and use." This is a real service to mankind.

A Resolution on Public Ownership

A RESOLUTION which was presented, but not passed, at the meeting of the American Electric Railway Association in New York last week virtually called upon the members to facilitate public acquisition of their properties. It was offered, evidently as the result of long study of conditions, by the president of a large holding company and referred to the executive committee of the association. Since the association did not pass definitely upon this important question involving the permanent control of utilities of this class, the only significant action is that the presentation of the resolution took place. What the association actually did was to adopt another resolution expressing the deliberate judgment that the entire subject of the relationship between electric railway companies and the public should have, now and after the war, most earnest consideration by both parties; and to further this end a committee is to be appointed to study reconstruction problems, "particularly those relating to local franchises."

It is not to be doubted that the electric railways are in a serious plight due to their enormous capital cost, high war-time costs of operation and the difficulty of raising fares. It is to be doubted whether the remedy for this condition now is the sale of the properties to the public. We believe that neither the companies nor the public would gain now by that procedure. What the companies—that is to say, the stockholders and bondholders—want is security of their principal and dividends or interest. What the public wants is good service at the lowest possible rates. Every one who has really studied the great obstacles to successful street-railway management will admit frankly that this class of utility is by far the most difficult of any class of utilities to operate, either physically or in public policy; but these facts call for qualities of management that are much less likely to be seen in

public office under our present political system than in private corporations. Good service, however, the public must have, and if the companies do not or cannot give it, whatever the cost may be, they are certain to find a public prejudiced against any proposition that they make. If they do give it, any talk of public ownership can safely be postponed to a later day.

Whatever means the electric railways and their public take to settle their differences, it should be understood clearly by all parties that electric light and power utilities reserve the right of independent solution of the problems which they face. All of the conditions of the two classes of properties are so different that it is manifestly unjust to let the impression go out that they are equally oppressed by the existing state of affairs. The undeniable predicament in which electric railways are caught is one for their managers to solve if and as best they can with such public help or sympathy as they can gain by wise, not complaining, appeal. If they cannot settle on any other solution, we offer the suggestion that they try to depart from the extremely unscientific flat-fare principle and adopt a complete and revolutionary zone system to encourage the short rider. It is the economic salvation of the electric light and power utilities that by intensive development of power business they have built up load factor and mass production. Their rate situation, their earnings applicable to capital return, their outlook for borrowing fresh funds when conditions are again normal and the quality of their service are far better than those of the sorely beset electric railways.

From an attempt to classify industries as "essential" or "non-essential" the authorities wisely passed to the classes "war," or "essential," and "less essential." Now we see that most of the "less essential" have become or are rapidly becoming essential. The conversion of industries to a war basis has gone on very swiftly. Relatively few plants are unadaptable to war uses. It will be found that when the military need is past the products of those plants can be converted very quickly to meet the peace requirements. And, electrical energy will still be necessary for their economical operation.

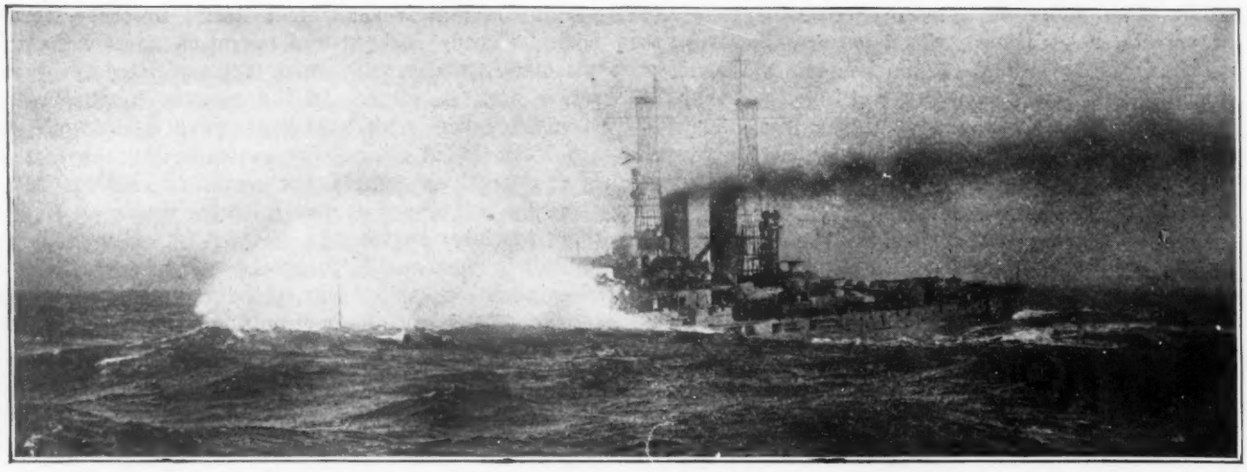
Safety Devices in Switching

THE evolution of the modern switchboard has rendered necessary a great many auxiliary devices never thought of in the earlier days of the art. As the capacity of stations has increased the number and size of switches has multiplied almost beyond measure. Most of the working apparatus is remote from the switchboard proper, so that the operator cannot observe the action of the apparatus itself but can only take the necessary steps to actuate it. It therefore has become necessary to develop an indicating system, sometimes of a highly complicated character, to show the operator what has really happened. In the paper of M. M. Samuels and F. Bechof this matter of automatic indicators is taken up somewhat in detail, especially the common bell alarm to be found in a very large number of stations. The main requirement of any such apparatus is that it shall reset itself; in other words, shall be ready for renewed operation as soon as the automatic switches with which it is associated are themselves back in place. In the case of hand-operated circuit breakers with lever switches in series, such as are often found on railway switchboards, the matter is comparatively simple, for auxiliary contacts operating the bell circuit at once solve the problem. Unless there are lever switches in series it is somewhat more difficult because auxiliary switches must be provided to accomplish the same result, and in some cases the resetting of the bell alarm circuit must be done by the operator.

The commoner situation in every-day practice is that of the electrically operated circuit breaker which may be tripped by overload or reverse relays. The danger here is that if the alarm circuit were operated directly by the relays the bell would ring only momentarily, and consequently a special relay had to be developed which would hold the alarm circuit closed at least long enough to attract the attention of the operator, or until stopped by him. Several devices of this character have been used with good results. The authors, however, call attention to a weak point in the arrangement of the devices customarily made in that all the tripping coils are usually in series with the alarm relay so that if the latter is out of service all of the tripping coils become inoperative, bringing the possibility of an interruption which may cause serious results. They suggest therefore that the alarm circuit, instead of being associated with the tripping coils. ought to be provided with an auxiliary mechanical switch put into operation by the opening mechanism of the circuit breakers. This need stay closed only momentarily so long as it is relayed on to the bell signal system.

Aside from the tripping of circuit breakers, which is the chief point in mind, there are divers other things in every station to which the switchboard operator's attention should be called by some kind of alarm, and these have been indicated in various ways by bells and other audible signals. The authors enumerate some eighteen separate pieces of apparatus which may with advantage be provided with alarms, and with such a number it is rather obvious that audible signals cannot give sufficiently specified information. It therefore seems advisable to fall back on an annunciator system connected with the various alarm circuits, with a signal bell and with drops corresponding with each requirement.

At first thought such an arrangement seems like a complication, while actually it simplifies the situation if any considerable number of alarms have to be considered. Furthermore, although the parts may be duplicated to any necessary extent an annunciator is really a very simple affair and extremely unlikely to get out of order. It seems curious to think of switchboards requiring so elaborate a system of indicators to show what is actually happening; but the fact is that switchboard design has for good or ill passed far beyond the stage where the operator can take visual cognizance of the switches, and with this great increase in complication has come the actual need for new methods of keeping track of the operation of the various scattered elements which are necessary.



GREAT INDUSTRIES, LIKE GREAT BATTLESHIPS, ARE CAPABLE OF WEATHERING SEVERE STORMS AND DIFFICULTIES

Problems of the Reconstruction Era

Taking an Effective Part in the Great World War, This Country Will Necessarily Be a Powerful Factor in the Succeeding Period—Closer Co-operation in the Electrical Industry Advocated

This article, pointing out the need for scientific consideration of the reconstruction problems, will be followed by others in later issues dealing with specific aspects of the subject.

MEN differ widely in their judgment on what the problems of reconstruction will mean to the electrical industry. Their viewpoint is still heated by our national immersion in the war and the preparations for still heavier participation if that is necessary; yet while we have been pursuing war aims with singleness of purpose, other nations, with their resources likewise devoted to conflict, have also found time to get plans made for meeting the new problems of peace.

Conspicuous among all the nations for its vast resources, brought to bear tardily but effectively in the great world contest, no one can seriously question that this country will necessarily be a powerful factor in the succeeding era. The reservoirs of raw materials, the American capacity for big-scale production, the manufacturing facilities greatly multiplied by war demands, and capable use of machine power and man power, together with our high national ideals, give this country a wonderful opportunity. Business and utilitarianism were not popularly supposed to mix under the old conditions but they may be combined most successfully under the world-wide needs left by the long years of the devastating war. The ravaged peoples of Europe need a helping hand. War in business is not to succeed the cruel military onslaught of Germany; the rehabilitation era calls for fine qualities of character, honorable dealings, not bitter competition.

In the absence of definite information on which to base his forecasts, the man in the electrical industry who looks ahead a little can judge only on the basis of the fragmentary facts which he can obtain. He knows that this country has developed a stupendous industrial war machine for the rigid control of price and distribution of raw materials the less rigid but firm control of manufacturing industries, and last but by no means least in importance, active production by government agencies or through government-controlled corporations. He does not know what measure of supervision, if any, will be retained throughout the reconstruction period by the War Industries Board or a similarly comprehensive government agency. If price regulation and arbitrary allocation of raw materials and manufactured products are to be discontinued directly after the war and the old economic law of supply and demand is to prevail, the electrical industry appreciates that it will have to base plans upon a condition involving enormous possibilities of change.

There are reports that the Washington authorities have collected through the Council of National Defense a mass of data bearing on reconstruction issues, but no public hearings have occurred and the attitude of the government, if any has been formulated, is not known. It is unfortunate that the government and industry as a whole did not begin to coöperate a year or more ago in laying the foundations for a study of these problems. The plan urged by the ELECTRICAL WORLD and associated engineering papers, creation of a broad-scale commission, could have been made to yield beneficial results by this time.

In the absence of a commission specially appointed to study these vitally important matters in their relation to the welfare of the nation, the knowledge and experience of existing government agencies should be given the fullest opportunity to render service to industry. With its extensive organization the War Industries Board provides, as indicated above, the machinery for control of price and allocation of raw materials if those policies shall be found to be necessary for the welfare of the world. Undoubtedly the Shipping Board and Emergency Fleet Corporation have much invaluable information concerning tonnage which will

enter into any scientific consideration of the needs of this country as well as of all other countries working together to build proper foundations for world peace.

Turning with questioning mind to see what other helps the Washington authorities can offer, the electrical business man sees the Department of Commerce, which continues steadily in its work of stimulating investigation of markets. Then his attention passes to the Tariff Commission, which is doing a very necessary constructive work in investigating tariff questions affecting industries of the country.

What is apparently lacking is some specially designated agency composed of the engineer, the statesman, the financier—men having broad vision, broad humanity of heart, large business ideas; in short, the true spirit of the big American brother who not only sees the national problems springing out of the war but also understands them in their bearing upon the problems of the other belligerent countries and the neutrals of the world. It is not yet too late to create a commission of this character, which could coördinate the enormous amount of information freely given to the Washington authorities to help in the war and draft a constructive policy for industry. Taking counsel of the existing associations in the country, seeking and hearing the engineers, business men, economists, labor leaders, bankers who are giving thought to the intricate questions involved, such a commission could still contribute suggestive recommendations. What is of as much importance, it would, by the mere fact of appointment and completion of a program, stimulate more intensive study of the subject throughout the country.

Lacking national guidance, wise national coöperation and forbearance, the industries of the country will have to face their problems without the constructive aid which European governments are generally prepared now to give to their industries. It is well known that the principal European powers have gone very carefully into the questions involved affecting their future industrial operations, material supply and markets.

It is fortunately true of the electrical industry that much which has been done under the stress of war is in reality fine preparation for the post-war period. Closer coöperation has been developed in each individual branch of the industry; and, in turn, the different branches are working more unitedly in coöperation than ever before. In the firmer union of interests which is now found government officials have taken part. They have urged coöperation to the end that economy, conservation, production might be appreciated at their real value, not for the benefit of industry as such, but for the attainment of national efficiency in war. What has happened through such channels of combined corporate and government effort, looking to the main purpose of victory over Germany, has served as an object lesson to radical government officials no less than to the representatives of the companies. The efficiency thus attained has bulked too large to be thrown away lightly. It is not likely that the advantages worked out will be lost to the world. Certainly the companies in the electrical industry will not voluntarily discard the benefits which their experience has yielded; and the government, with facts, processes and costs freely put before it in the national emergency, has found the economic strength of great units of too much advantage to the community to justify return to the old antagonism.

Some of the elements of commercialism have totally disappeared in the operations of companies under the pressure of war work, and the return to the former status of unrestricted production and unrestricted markets will be one of the principal ultimate changes.

VISION OF THE ENGINEER IN RECONSTRUCTION

BY PROFESSOR COMFORT A. ADAMS
President American Institute of Electrical Engineers

WHEN the war began it was immediately recognized by a few that its successful conduct required a degree of coördination of industry undreamed of before. In short, it meant the organization of the nation. The task was simply stupendous, and as we were utterly unprepared it is no wonder that there was much floundering and inefficiency and many misfits. The result, however, is not wholly disgraceful and has much of merit. Many lessons in industrial coöperation have been learned under war pressure, and the whole economic and industrial structure has been shaken up and in some degree remolded.

Now we are shortly to be faced with the need for readjustment to peace-time conditions, and we are just about as unprepared as we were for war. Even if we were to return completely to the pre-war order of things, the process would be a difficult one, requiring the maximum of wisdom and of organized effort; but is it not possible that some of the lessons learned during this forced period of coöperation can be employed in times of peace? Is it not possible that after this breaking away from old habits and traditions, and during this period of flux, we can get a better perspective of our duties and relations to each other, as individuals, as social or industrial groups and as nations?

Moreover, as this is distinctly an industrial epoch and as the engineer is paramount in industry, should we not as engineers take our proper place in this work of reconstruction? We are too apt to sit back and complain that we are not properly recognized in large questions of public interest, but is it not our own fault? In any case, now is our great opportunity. If we have the vision and the ability to transmit it, we will certainly be heard. Let us go to it.

Safety Features in Switching Installations

Review of Existing Alarm Systems Used to Indicate Switch Positions and Overheating of Apparatus—Weak Points in the Installations and Suggestions Designed to Bring About Their Improvement

BY M. M. SAMUELS AND F. BECHOFF

In previous articles (ELECTRICAL WORLD, Vol. 71, page 656 and page 1075) the authors discussed general safety methods in switching arrangements, giving suggestions for safe arrangements and connections of switching apparatus. It is the object of the present article to discuss in detail the problem of the bell alarm.

IN EVERY generating station or substation of good size the major portion of the switching apparatus is installed remote from the switchboard, so that the switchboard operator is not in a position to observe the automatic tripping of circuit breakers or the excessive heating of transformers and other apparatus. It is, therefore, necessary to provide some form of alarm for this purpose. In spite of the obvious importance of such alarms the subject has hardly ever been discussed in engineering literature, and a great deal of confusion and misconception with reference thereto exists in the minds even of some good designers and operators. It is the authors' intention to give first a brief review of the existing methods of alarm, then discuss their weak points and make suggestions for improvements.

The fundamental requirement of any alarm is that it must be self-resetting. In other words, when the apparatus which caused the alarm is again placed in normal operation the alarm-giving device should automatically be ready to give an alarm if trouble recurs.

ALARMS FOR HAND-OPERATED CIRCUIT BREAKERS

For hand-operated circuit breakers having lever switches in series with them, as is customary on railway switchboards, the alarm connections can easily be arranged as shown in Fig. 1. With this method auxiliary contacts are provided on the circuit breaker as well as on the lever switch, both the auxiliary switches being in series with a bell circuit. The auxiliary switch on the circuit breaker is open when the circuit breaker is closed and is closed when the circuit breaker is open, while the auxiliary switch actuated by the lever switch is closed when the lever switch is closed and is open when the lever is open. Thus when the breaker trips automatically it closes the bell circuit, as shown in position 2 of Fig. 1, thereby ringing the bell. The operator may interrupt the ringing of the bell by opening the lever switch as shown in position 3 of Fig. 1. When the lever switch is closed after reclosing the breaker the bell circuit is made automatically ready to give an alarm if the breaker trips again.

For circuit breakers not having lever switches in series with them the problem becomes a little more difficult. In order to provide automatic resetting of the bell circuit it is necessary to equip the circuit breaker with a double-pole auxiliary switch, one side of which is closed when the circuit breaker is closed and the other side closed when the circuit breaker is open. Such an auxiliary switch is called a "circuit closing and opening auxiliary switch." In addition to this it is necessary to provide on the switchboard a three-way snap or push switch for each circuit breaker, as shown in Fig. 2, the diagram being self-explanatory. With this arrangement the resetting of the bell circuit is not automatic but must be done by the operator. In order to remind the operator to reset the three-way push-button, the circuit breaker rings the bell when it closes and the ringing is only stopped when the operator resets the button.

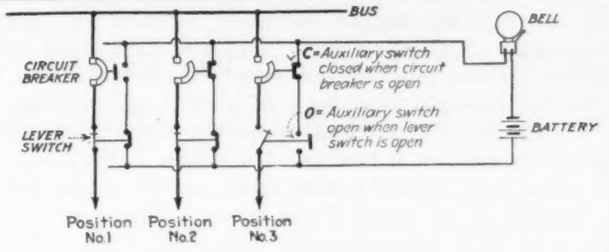
ALARMS FOR ELECTRICALLY OPERATED CIRCUIT BREAKERS

Of far greater importance is the bell-alarm indication for electrically operated circuit breakers. Such circuit breakers are always placed at a considerable distance from the switchboard and may in some cases, as for instance in outdoor substations or along railroad tracks, be miles away from the switchboard. Automatic electrically operated circuit breakers are tripped by means of overload, reverse-energy or other types of relays. Such relays are always deënergized the moment the breaker opens, and if the bell alarm were operated directly by the overload relay the bell would only ring for a very short period and might stop ringing before the operator heard it.

To avoid this objection a special type of relay has been developed which is so constructed that the contacts which close the bell circuit stay closed even after the circuit of its coil is interrupted. Thus the bell should continue ringing until stopped by the operator. Such relays are commonly known as "bell-alarm relays." Figs. 3 and 5 show the connections of two of the best-known bell-alarm relays. The type shown in Fig. 3 is so constructed that the core which closes the bell circuit contacts stays up after it is once raised by the coil, even after the coil circuit is broken. In order to interrupt the bell circuit it is necessary for the operator to pull the core down by hand, which can be done by means of a knob at the bottom of the relay. This relay must, of course, be mounted within easy reach of the operator. With the relay shown in Fig. 5 the ringing of the bell is maintained by means of an auxiliary coil having common yoke with the main relay coil; interruption of the bell circuit is accomplished by means of a normally closed momentary push-button on the switchboard. It would not be practicable to provide a separate bell and a separate bell relay for every automatic circuit breaker; therefore it is customary to make one bell relay with its bells serve for a great many circuit breakers. This is accomplished by means of a bell relay bus, as shown in Fig. 6.

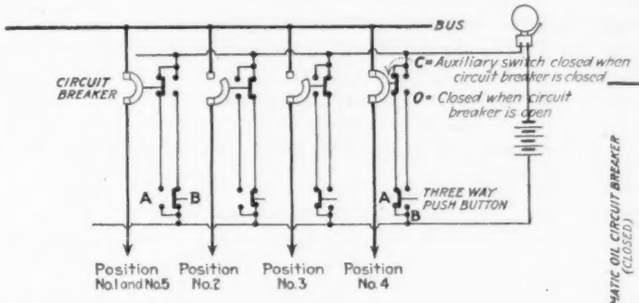
Upon carefully analyzing the connection shown in Fig. 6, which exists in practically every power house or substation using electrically operated circuit breakers, the most startling discovery is made that every trip

BELL-ALARM CONNECTIONS UNDER DIFFERENT CONDITIONS



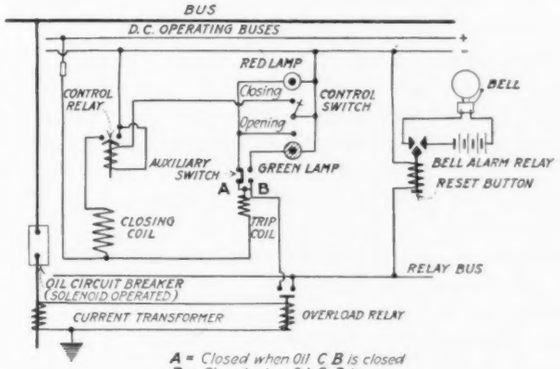
Position No.1 *Circuit in working condition*
Position No.2 *Circuit breaker opened automatically. Bell is ringing*
Position No.3 *Operator opened lever switch which stopped bell*

FIG. 1



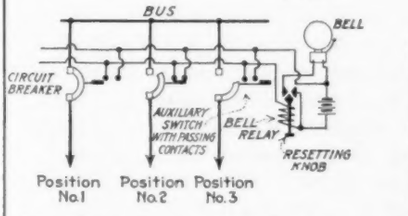
Position No.1 *Circuit in working condition*
Position No.2 *Circuit opened automatically. Auxiliary switch starts bell*
Position No.3 *Operator brings three way push button from B to A thus stopping the bell*
Position No.4 *Circuit breaker closed again. Bell rings*
Position No.5 *Operator brings three way push button back from A to B thus stopping bell and resetting it for next tripping of circuit breaker*

FIG. 2



A = Closed when Oil C.B. is closed
B = Closed when Oil C.B. is open

FIG. 3



Position No.1 *Circuit in operating condition*
Position No.2 *Circuit breaker just opening energizing bell relay by auxiliary switch passing contacts*
Position No.3 *Circuit breaker all open. Bell relay not energized but bell relay contacts still closed. Bell circuit can now be broken by resetting bell relay*

FIG. 4

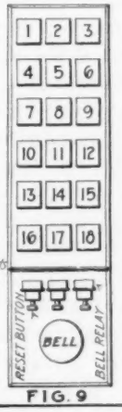


FIG. 9

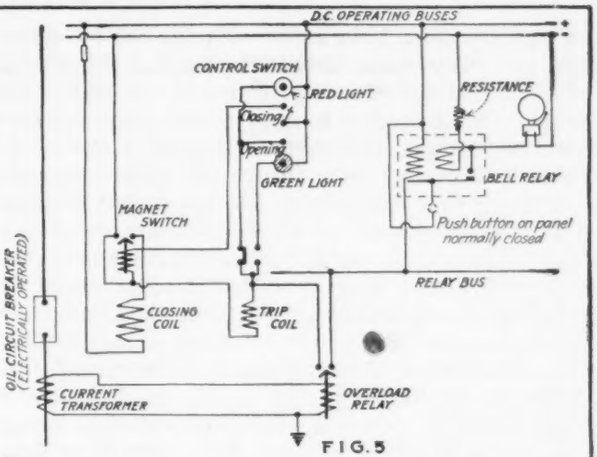
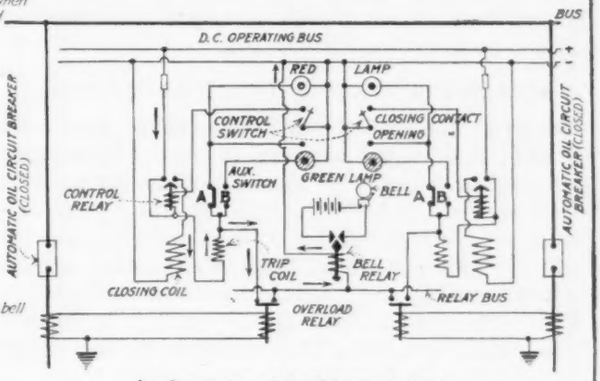


FIG. 5



A = Closed when oil circuit breaker is closed
B = Closed when oil circuit breaker is open

FIG. 6

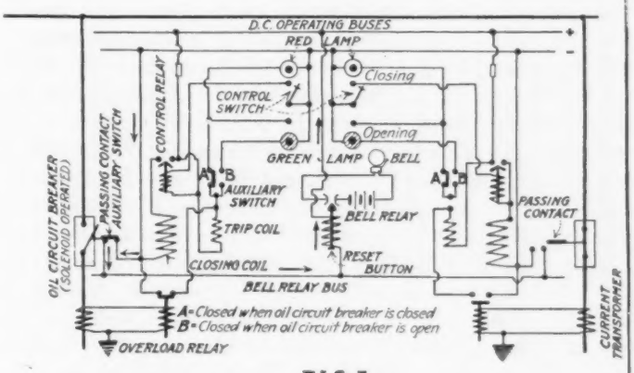


FIG. 7

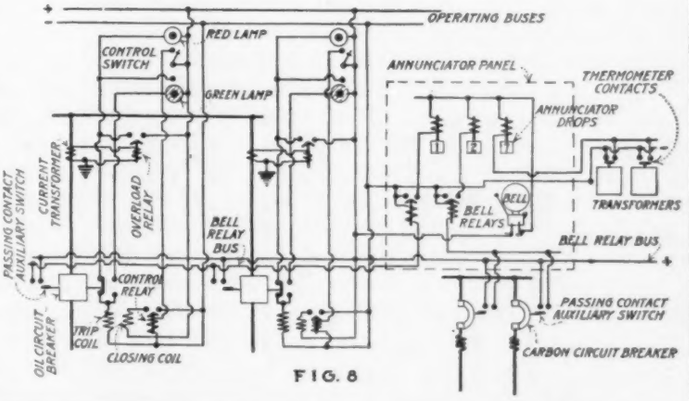


FIG. 8

1 and 2—Circuit breakers with and without lever switch in series; 3 and 5—bell relay mechanically and electrically reset; 4—auxiliary switch operates bell alarm; 6—trip coil in series with bell alarm; 7—tripping circuit independent of bell alarm; 8—connections for annunciator making trip coils independent of alarm; 9—annunciator with bell-alarm relays.

coil on the system is in series with the one bell-alarm relay coil. This means that if the one bell-alarm relay coil should be out of service it would not be possible for any circuit breaker to open under overload, short circuit or reverse energy, thus subjecting the whole system to disaster. Even though the bell-alarm relay is of very simple construction and not subject to great abuse, the possibility of an interruption is always present. It seems to be due to good fortune only that one does not often hear of station troubles caused by the failure of a bell-relay coil. It is possible that many station disasters in the past the cause of which could not be traced were in reality due to an interruption of a bell-relay circuit. A partial remedy can be obtained by the use of two bell relays in multiple, which method is now being employed in some cases. But it must be admitted that such a remedy is only a palliative and does not go to the root of the evil.

SAFE METHOD THAT FUTURE WILL DEMAND

The only safe method to be employed in the future and to be favored by insurance companies is to make the automatic tripping of the circuit breaker entirely independent of the bell-relay coil. In order to accomplish this it is suggested that there be provided on every electrically operated circuit breaker a "passing contact auxiliary switch," which should be so constructed that it is actuated mechanically by the opening mechanism of the circuit breaker. This auxiliary switch should be so arranged that it closes only momentarily during the opening period of the circuit breaker. This short period would be sufficient to energize a bell relay, the contacts of which would stay closed even after the "passing contact auxiliary switch" is open and thus would continue to ring the bell until the operator resets the bell relay. A diagram showing the simplest form of this arrangement is given in Fig. 7, which is self-explanatory. With the scheme shown in Fig. 7 the bell would also ring when the circuit is opened by hand. Instead of being a disadvantage this should be considered an advantage, because the operator who is not in the same room with the circuit breaker, when hearing the bell will know definitely that the circuit breaker actually opened. If so desired, this same auxiliary switch in its simplest form would also ring the bell when the circuit is being closed, which would be a definite indication for the operator that the switch is actually closed, even when the red lamp is burnt out. For remote-control hand mechanisms, which generally have no indicating lamps, the ringing of the bell when the operator closes or opens a circuit breaker would be of still greater importance. If the ringing feature is not desired when closing the circuit breaker it can be easily eliminated by a suitable design of the "passing constant auxiliary switch." By referring to Fig. 7 it will be seen at once that the tripping circuit has no connection whatever with the bell-alarm relay, so that an injury to the bell-relay coil circuit will not endanger the tripping of the circuit breaker under overload.

The "passing constant auxiliary switch" can also be applied to hand-operated circuit breakers, as shown in Fig. 4. This arrangement would eliminate the necessity of installing a three-way push-button for every circuit breaker, as described before in connection with Fig. 2.

In addition to the automatic tripping of circuit breakers there are a great many other things in every power house to which the operators' attention must be called through some form of alarm, and in order to distinguish the different operations which the various alarms indicate it has been the custom to provide bells of various sizes and various tones, and to use in addition electric horns, whistles and sirens. When considering the great number of alarms to be distinguished it will at once be obvious that with the many noise-making devices thus installed it is almost impossible for an operator to tell quickly and definitely just what kind of trouble has occurred when a certain alarm sounds. Without intending to give an exhaustive list of the various forms of alarms in a power house the following will give some idea of the complexity of the subject:

1. Oil-circuit-breaker alarm.
2. Carbon-circuit-breaker alarm.
3. No-voltage alarm on buses.
4. Generator overload alarm without tripping the circuit breaker.
5. Ground alarm.
6. Apparatus high-temperature alarm.
7. Transformer water-flow alarm.
8. Transformer air-blast alarm.
9. Generator air-washer alarm.
10. Storage-battery undercharge and overcharge alarm.
11. Lightning-arrester discharge alarm.
12. Track alarm on heavy railway work.
13. Lead-sheath protection alarm for heavy underground cable systems.
14. Fire alarm.
15. Telephone bell, private line.
16. Telephone bell, outside calls.
17. Generator signal system.
18. Call bell.

MAIN ANNUNCIATOR SYSTEM

It is at once obvious that if it is attempted to distinguish all the above varieties of alarms and many more through differently sounding bells or other noise-making devices, it would be almost impossible even for an operator with a musically trained ear to recognize quickly the different sounds. In spite of the obvious inconvenience of such a combination of sounds, different-tone signals are unfortunately still used in many power houses. To avoid this confusion modern power houses are being equipped with a main annunciator having a different drop for each of the kinds of alarm listed above. With this arrangement only one bell is required in a switchboard room. Such an annunciator should be made in the form of a switchboard panel, preferably installed in the center of the switchboard. On this panel can also be mounted the necessary number of bell-alarm relays and the bell. A typical panel of this kind is shown in Fig. 9, where the numbers indicate the annunciator drops corresponding to the various kinds of alarm in above list. A typical diagram of connections is given in Fig. 8. It must be understood that it is not the object of the main annunciator to indicate in detail which individual circuit breaker is tripped or which individual transformer is hot, but merely to give the group of apparatus affected. In the case of electrically operated circuit breakers the drop on the anunciator would indicate that some circuit breaker of a certain group tripped. The green indicating lamp in combination with the mechanical indicator on the control switch (see ELECTRICAL WORLD, Vol. 71, page 656) will then indicate the individual circuit affected.

INCREASING THE ECONOMY OF CENTRAL-STATION OPERATION

Overhauling Water Conduits and Prime Movers, Burning Natural Gas to Save Fuel Oil, and Other Proved Methods

BY J. W. ANDREE
Assistant Superintendent Department of Generation, Southern California Edison Company

SOUTHERN California being a large fuel-oil producing section, there has as yet been no real shortage of fuel there. However, oil consumption is rapidly increasing, and there are grave possibilities of a real fuel-oil shortage in the near future. All possible means are therefore being devised to decrease the consumption of fuel oil. All the water powers of southern California are being utilized to their utmost, hardly a drop of water going to waste in this section which can be put into use at a reasonable cost. At the Lytle Creek plant of the Southern California Edison Company wells have been sunk in the river bed below the diversion dam, and the underflow of the river is pumped from these wells into the conduit leading to the power plant by motor-driven pumps.

On the Santa Ana River water rising below the diversion dams of the upper plants is diverted into the intake of the lower plants. The pipe lines of the Mill Creek No. 3 plant have been cleaned of all vegetable and animal growth to decrease resistance to the flow of water. Nature has lent a helping hand at this plant to increase its output. The winter rains always leave the river bed very rough and full of porous gravel, which encourages a large underflow of water. Early summer rains this year have brought down an abundance of silt and cement-like deposit, which has effectively filled many of the voids in the river bed and thus decreased the underflow, and as a result the flow of this river has been much larger than in other years of equal rainfall.

At the Mill Creek No. 2 plant water which flows under the diversion dams is diverted into the canal at a lower point. New buckets are being designed for this plant which should increase its efficiency from 10 to 15 per cent. The waterwheels in the Mill Creek No. 1 plant have been recently overhauled, and the design of the needle valve and tips has been changed to give the highest possible efficiency on the old-type equipment of this plant.

INCREASING WATERWHEEL EFFICIENCY

The design of the needle valves and tips of the Azusa plant is being changed to increase the efficiency of the waterwheels. The nozzle tip on one of the waterwheels at the Sierra plant has been made larger to increase the output of the plant during periods of high water. At this plant it is also contemplated to replace the old two-phase, 500-volt generators with 11,000-volt generators of modern design from the Pedley plant, operation of which has been discontinued. By doing this the electrical efficiency of the plant will be increased and transformer losses will be eliminated because the generators will feed directly into the 11,000-volt distribution system.

As mentioned in previous issues of the ELECTRICAL WORLD, all important transmission systems of southern California are interconnected, the larger and more efficient plants being operated at full load and the smaller and less efficient plants used only to carry peak loads. Frequency-changer sets have been placed in operation between the systems operating at different frequencies. A 5000-kw. frequency-changer set is in operation at Colton, connecting with the Southern Sierras Power Company, and similar units are in operation at San Juan Capistrano and Magunden, connecting with the San Diego Gas & Electric Company and the San Joaquin Light & Power Company respectively.

The Kern River No. 1 plant is being operated at 60 cycles on the San Joaquin Light & Power Company's system, and it in turn is feeding the Mount Whitney Power & Electric Company at the same frequency. At such times as there may be an excess of hydroelectric power on these systems the excess can be diverted to the Southern California Edison Company's system through the frequency changer at Magunden, or the generators at the Kern River No. 1 plant may be changed to the 50-cycle system. This change can be accomplished with an interruption of only fifteen minutes (on the generator being changed) if all generators are running loaded and with no interruption at all if three or fewer are in operation.

OVERHAULING A 20,000-KW. TURBINE

At the Long Beach steam plant, the most efficient unit, a 20,000-kw. turbine is being completely overhauled from top to bottom, including all auxiliaries. This work is being rushed day and night with all possible speed and will probably be completed in the record time of thirty-five days. When these repairs are completed the efficiency of this unit will be increased about 10 per cent. During the time this turbine is out of service the boilers which belong to this installation are used to furnish steam to the other turbines in this station. This is done because these boilers have a higher efficiency than the other boilers of the plant, these being equipped with economizers. All boilers which are out of service are being thoroughly overhauled and put into first-class operating condition to carry a heavy load as soon as the turbine repairs are completed. While this turbine is being repaired the load is carried on the Redondo plant. The economy of the Redondo plant is slightly less than that of the Long Beach plant, but the increase of efficiency at the Long Beach plant due to this overhauling of the No. 3 turbine unit will soon counterbalance any loss due to operation of the less efficient plant during repairs at Long Beach.

To decrease the consumption of fuel oil at the Redondo plant one-third of the total number of boilers have been equipped with furnaces for burning natural gas. Those furnaces are of the multiple-burner type, there being 180 gas jets distributed over the entire floor of the furnace. The gas enters the furnace from the front through five 2½-in. (63-mm.) extra-heavy pipe laterals extending the full depth of the furnace under the furnace floor. At intervals of about 9 in. (25 mm.) these laterals are tapped on each side for 0.5-in. (13-mm.) pipe nipples, which are capped with standard pipe caps and have a $\frac{3}{16}$-in. (5-mm.) hole drilled in the top near the outer end. Over this opening is placed a fireclay burner tube 15 in. (38 cm.) long and 3 in. (8 cm.) inside diameter. These tubes have a slot cut in one side which straddles the 0.5-in. nipple with the orifice in the center of the tube and 12 in. (30 cm.) from the top.

The top of the tube is flush with the floor of the furnace, and baffle bricks are laid over the tube opening to diffuse the gas flame. The furnace floor is supported on 2-in. (5-cm.) standard pipe. This furnace burns the gas very efficiently, and the flame is so evenly distributed that there is practically no danger of burning or blistering of the boiler tubes. To avoid damage to the clay-burner tubes due to expansion of the furnace floor, the floor is loosely laid with mortar containing asbestos.

These furnaces are also equipped with front-shot oil burners for use in emergency when there is a failure of the gas supply. While the efficiency of oil burners in these furnaces is not very good, still it is more economical to use them for short periods of gas interruption rather than to warm up cold boilers which are equipped with oil-burning furnaces. The oil burners can be put into operation on instant notice so there is no interruption of the supply of steam.

In the operation of steam plants the scarcity of skilled boiler-room attendants is a very deplorable fact. It is almost impossible to obtain experienced men for this class of work, and with new, inexperienced men it is impossible to obtain good results in that portion of the plant where the greatest saving in fuel is possible by efficient operation.

COMPENSATION BY GOVERNMENT FOR BELL TELEPHONE SYSTEM

Theodore N. Vail Says that the Telephone Representatives Found an Intent and Desire to Pay All That Ought to Be Paid

Theodore N. Vail, president American Telephone & Telegraph Company, announces the principles adopted as a basis of compensation for the Bell telephone properties, taken over by the government for the period of the war. Mr. Vail states that the Bell system representatives "throughout the negotiations found nothing but helpfulness. Asking no more than they thought ought to be paid by the government, they found an intent and desire to pay all that ought to be paid, and for the protection of the property to do all that ought to be done and all that has been done in the past. In taking over the property the Postmaster-General also desires to give continuity to the service and, as far as consistent with government operation, to the personnel which has brought this property to its present degree of efficiency.

"From the first exchange of views until the close the Bell representatives were met by the Postmaster-General and his representatives in a spirit of absolute fairness and with an earnest desire to preserve the service to the public and preserve the property for the proprietors as well as to give them established returns on their securities."

The principles adopted as a basis of compensation were:

First—Any compensation fixed for the period of control was to be considered as compensation for an emergency period and not in any way considered as establishing a value for the property.

Second—The operation of the property is to be continued on a basis of efficiency relatively equal to that of the past.

Third—The property is to be fully maintained so as to be turned back to the company as good as when received.

Fourth—Appropriation from current revenue for maintenance depreciation and obsolescence to be the same as the past—an average of 5.72 per cent on the fixed capital; amortization of intangible capital to be relatively equal to the past. All unexpended balances from both to be invested in the plant of the system. Charges against the depreciation reserve to be in accordance with the rules of the Interstate Commerce Commission.

Fifth—Employees' pensions, disability benefits and death benefits now in operation to be continued.

Sixth—All taxes, municipal, state or federal, to be paid, or reimbursed if paid by the companies, by the government.

Seventh—The license and rental contract between the American Telephone & Telegraph Company and the licensee companies to be continued, and the American Telephone & Telegraph Company is to give such advice and assistance as the Postmaster-General may require, and to maintain its scientific, technical and engineering departments and its patent protection for the benefit of the property in the same manner as heretofore. The Postmaster-General is to have the benefit during the period of control, in the operation of the wire system, of all inventions, discoveries and ideas which may now or hereafter be controlled by the Bell system.

"These provisions," says Mr. Vail in his statement, "are for the protection of the property, the service and the art and provide for the continuation of the service and for the continual development of the art, as well as the protection of the developed situation, and are for the full protection of the public in its services and the proprietors in the property and development."

Other details in Mr. Vail's announcement follow:

For the security holders is provided:

(a) Payment of the interest and existing amortization charges on all outstanding securities or obligations of the Bell system in the hands of the public, including the 6 per cent convertible bonds issued Aug. 1, 1918.

(b) Payment of dividends at the existing rate upon the share capital of the Bell system outstanding in the hands of the public.

(c) Payment of any charges, interest, dividends or other costs on new securities or share capital issued in discharge, conversion or renewal or extension of present obligations.

For extension to property:

As provided above, unexpended depreciation shall be invested in property of the system. American Telephone & Telegraph Company surplus shall be invested in its property. Surplus profits from operation may be invested by the Postmaster-General.

If securities or capital can be issued at fair terms, the Bell system will issue its securities if desired, but the nominal value of the securities shall not exceed 80 per cent of the amount expended in the property.

Extensions to its property made with the approval of the Bell system by money furnished by the Postmaster-General shall be paid for in installments of 5 per cent per annum after the period of control ceases.

Extensions by the Postmaster-General to meet abnormal conditions and made without the approval of the system shall be appraised by the Interstate Commerce Commission at the end of the period of control and their value to the system as appraised shall be paid for in installments of 5 per cent per annum.

The whole basis of the negotiation on both sides was to ask no more than was right, to grant all that was right and to protect a great property and a great service to the public in every possible way.

The public should bear in mind that we are in the midst of very abnormal times. Scarcity of labor, high costs of living and great increases in demands on the service which are congested and not well distributed will create conditions which it will be difficult for the telephone systems to meet, no matter how much charges and wages are increased, and some consideration must be given before criticism is indulged in.

Inspection of Electric Welds

Lack of a Satisfactory Method for This Operation Has Been Responsible in Very Large Measure for the Hesitancy Shown in Adopting Metallic-Electrode Arc Welding—Relative Efficiency of the Various Tests Known

BY O. S. ESCHOLZ
Research Engineer Westinghouse Electric & Manufacturing Company

DETERMINING the character of welded joints is of prime importance, and the lack of a satisfactory method, more than any other factor, has been responsible for the hesitancy encountered among the engineering profession toward the extensive adoption of electric welding. To overcome this prejudiced attitude the rapidly accumulating knowledge must be shaped into an acceptable method of inspection.

The four factors which determine the physical characteristics of the metallic-electrode arc welds are fusion, slag content, porosity and crystal structure. Some of the important methods that have been suggested and used for indicating these characteristics are:

1. Examination of the weld by visual means to determine:

(a) Finish of the surface as an index to workmanship.

(b) Length of deposits, which indicates the frequency of breaking arc, and therefore the ability to control the arc.

(c) Uniformity of the deposits, as an indication of the faithfulness with which the filler metal is placed in position.

(d) Fusion of deposited metal to bottom of weld scrap as shown by appearance of under side of welded joint.

(e) Predominance of surface porosity and slag.

2. The edges of the deposited layers may be chipped with a cold chisel or calking tool to determine the relative adhesion of deposit.

3. Penetration tests to indicate the linked unfused zones, slag pockets and porosity, by:

(a) X-ray penetration.

(b) Rate of gas penetration.

(c) Rate of liquid penetration.

4. Electrictal tests (as a result of incomplete fusion, slag inclusions and porosity), showing variations in:

(a) Electrical conductivity.

(b) Magnetic induction.

These tests if used to the best advantage would involve their application to each layer of deposited metal as well as to the finished weld. Except in unusual instances, this would not be required by commercial practice, in which a prescribed welding process is carried out.

RELATIVE EFFICIENCY OF TESTS

Of the above methods the visual examination is of more importance than is generally admitted. Together with it the chipping and calking tests are of particular usefulness. The latter test serves to indicate gross neglect by the operator of the cardinal welding principles, owing to the fact that only a very poor joint will respond to the tests.

The most reliable indication of the soundness of the weld is offered by the penetration tests. Obviously, the presence of unfused oxide surfaces, slag deposits and blow holes will permit different degrees of penetration. Excellent results in the testing of small samples are made possible by the use of the X-ray. However, because of the nature of the apparatus, the amount of time required and the difficulty of manipulating and interpreting results, it can hardly be considered at the present time as a successful means to be used on large-scale production.

The rate that hydrogen or air leaks through a joint from pressure above atmospheric, atmospheric, or from atmospheric to partial vacuum, can readily be determined by equipment which would be quite cumbersome, and the slight advantage over liquid penetration in time reduction is not of sufficient importance to warrant consideration for most welds.

Of the various liquids that may be applied kerosene has marked advantages due to its availability, low volatility and high surface tension. Owing to the latter characteristics kerosene sprayed on a weld surface

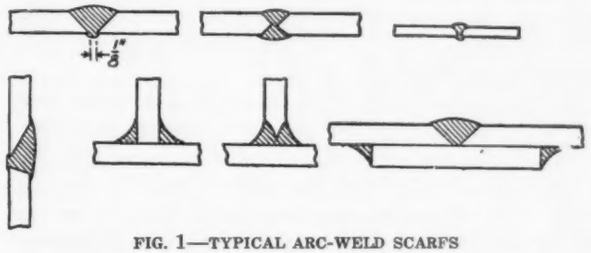


FIG. 1—TYPICAL ARC-WELD SCARFS

is rapidly drawn into any capillaries produced by incomplete fusion between the deposited metal and weld scarf, or between succeeding deposits, slag inclusions, gas pockets, etc., penetrating through the weld and showing the existence of an unsatisfactory structure by a stain on the emerging side. A bright red stain can be produced by dissolving suitable oil soluble dyes in the kerosene. By the means of this test the presence of faults that could not be detected with hydraulic pressure or other methods has been discovered. By the kerosene penetration a sequence of imperfect structures linked through the weld, which presents the greatest hazard in welded joints, could be immediately located. It must be borne in mind, however, that this method is not applicable to the detection of isolated slag or gas pockets, nor to small disconnected unfused areas. It has been shown by various tests that a weld may contain a considerable amount of distributed small imperfections without affecting to a great extent its characteristics.

If a bad fault is betrayed by the kerosene test, it is advisable to burn out the metal with a carbon arc before rewelding, under proper supervision. By the

means of sand blast, steam, gasoline, etc., large quantities of kerosene are preferably removed. No difficulty, however, has been encountered on welding over a thin film of the liquid.

Electrical test methods by which the homogeneity of welds is determined are still in the evolutionary stages. Obvious difficulties are yet to be overcome before the electrical test is feasible. Some of the difficulties are the elimination of the effect of contact differences, the influence of neighboring paths and fields and the lack of practicable, portable instruments of sufficient sensitivity for the detection of slight variations in conductivity or magnetic-field intensity. No simple tests are plausible, excepting those which involve subjecting the metal to excessive stresses for determining the crystal structure. Control of this phase must be determined by the experience obtained from following a prescribed process.

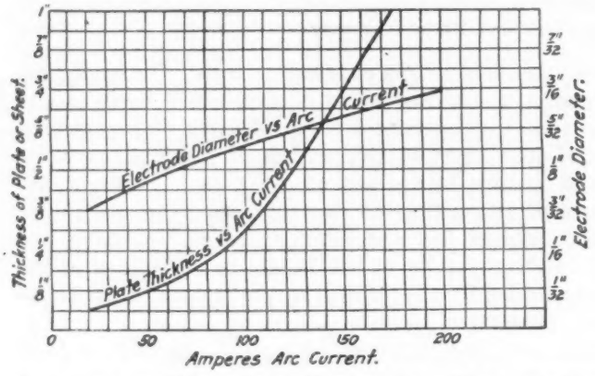


FIG. 2—ARC CURRENTS AND ELECTRODE DIAMETERS FOR WELDING STEEL PLATE OF VARIOUS THICKNESSES

The inspector of metallic-electrode arc welds may consider that through the proper use of visual, chipping and penetrating tests a more definite appraisal of the finished joint may be secured than is possible in either riveting or concrete construction. The operation may be still further safeguarded by requiring rigid adherence to a specified process.

Metallic-electrode arc welding is readily susceptible to close control. Regardless of the metal welded with the arc, the cardinal steps are:

1. Preparation of weld.
2. Electrode selection.
3. Arc-current adjustment.
4. Arc-length maintenance.
5. Heat treatment.

Sufficient scarfing, as well as the separation of the weld slants, should be provided in the preparation of the weld, so that the entire surface will be accessible to the operator with a minimum amount of filling required. When necessary to avoid distortion and internal stresses due to unequal expansion and contraction strains, the metal is preheated or placed so as to permit the necessary movement to occur. Various types of scarfs in common use are shown in Fig. 1.

The electrode selection is determined by the mass, thickness and the constitution of the material to be welded. An electrode free from impurities and containing about 17 per cent carbon and 5 per cent manganese has been found generally satisfactory for welding low and high carbon as well as alloy steels. This electrode can also be used for cast-iron and malleable-iron welding, although more dependable results, having a higher degree of consistency and permitting machining of welded sections, can be obtained by brazing, using a copper-aluminum-iron alloy electrode with the aid of some simple flux. Successful results are obtained by brazing copper and brass with this electrode. The diameter of the electrode should be chosen with reference to the arc current used.

EFFECT OF TOO LOW CURRENT VALUES

A great many concerns have attempted welding with too low an arc current, and the result has been porosity and a poorly fused deposit. This practice has probably resulted from the overheating of most electrode holders on rated currents, thus leading the operator to come to the conclusion that the current used is in excess to the amount needed.

The approximate values of arc current to be used for given thickness of mild steel plate, as well as the electrode diameter for a given arc current, may be taken from the curve in Fig. 2. The variation in the strength of 1-in. (25-mm.) square-welded joints as the welding current is increased is shown in Fig. 3.

Notwithstanding that the electrode development is still in its infancy, the electrodes available are giving quite satisfactory results. However, considerable strides can yet be made in the ductility of welds, in obtaining consistency in results, as well as in the ease of utilizing the process.

The maintenance of a short arc length is imperative. A non-porous, compact, homogeneous, fused deposit results from a short arc, while a porous, diffused deposit results from a long arc. A skillful operator usually maintains a short arc, as the work is thereby expedited,

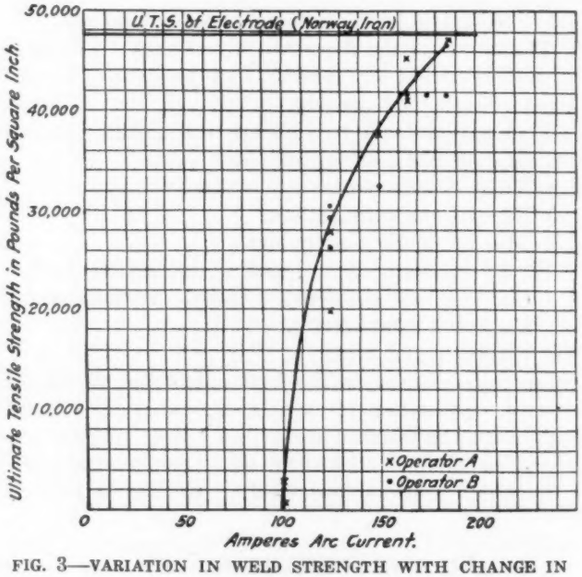


FIG. 3—VARIATION IN WELD STRENGTH WITH CHANGE IN ARC CURRENT

less electrode material is wasted and a better weld is obtained, due to improved fusion, decreased slag content and porosity. By observing the arc current and arc voltage from meter deflections or instrument records the inspector is able to keep a check on the most important factors which affect weld strength, ductility, fusion, porosity, etc. By the use of a fixed series re-

sistance and an automatic time-lag reset switch across the arc to fix definitely both the arc current and the arc voltage, these important factors are placed entirely beyond the control of the welder and under the direction of the more competent supervisor.

HEAT TREATMENT AND INSPECTION

The method of placing the deposited layers has an important effect on the internal strains and distortion obtained during contraction. It is possible that part of these strains could be relieved by preheating and annealing, as well as by preparation for the movement of the metal.

The heat treatment of a completed weld is not a necessity, particularly if it has been preheated for preparation and then subjected to partial annealing. A uniform annealing of the structure is desirable, even in the welding of the small sections of alloy and high carbon steels, if it is to be machined or subjected to heavy vibratory stresses.

In addition to applying the above tests to the completed joint and effectively supervising the process the inspector can readily assure himself of the competency of any operator by subjecting sample welds to ductility and tensile tests or by simply observing the surface exposed on cutting through the fused zone, grinding its face and etching with a solution consisting of one part of concentrated nitric acid in ten parts of water.

It is confidently assumed, in view of the many resources at the disposal of the welding inspector, that this method of obtaining joints will rapidly attain successful recognition as a dependable operation to be used in structural engineering.

War-Time Lighting Economies

Salient Features of Report Prepared by the War Service Committee of Illuminating Engineering Society for the United States Fuel Administration—Fallacies to Be Avoided—Making Maximum Use of Daylight

WHILE only about 2½ per cent of the total coal output of the United States (700,000,000 tons) is consumed in the production of artificial light, any part of this that is saved through lighting economies will assist in the conservation of coal which must be saved if the war ability of the nation is not to be impaired. In view of this fact the committee on war service of the Illuminating Engineering Society,* at the request of the Fuel Administration through the National Committee on Gas and Electric Service, has compiled some very valuable suggestions on "War-Time Lighting Economies" in the form of a bulletin. Limiting the use of artificial light to the minimum necessary number of hours per day and promoting the most efficient use of artificial light during those hours are the general methods proposed. In various places it is suggested that local lighting companies be consulted.

Discussing the problem more in detail, the I. E. S. committee on war service points out that unnecessary lighting can be eliminated by making the maximum use of daylight and by avoiding useless lighting. Dirty glassware and fixtures, dark ceilings and walls and inefficient lighting equipment are also productive of waste. Excessive or extravagant lighting must be curtailed.

FALLACIES TO BE AVOIDED

There are certain fallacies which must be guarded against in effecting lighting economies and the committee refers to these saying:

Removing reflectors or shades from lamps in order to "get more light" defeats the object. The raw light from glaring bare lamps is less effective than a smaller quantity of reasonably diffused light not exposed to the eye.

Attempting to economize by reducing the number of lamps or by using smaller lamps indiscriminately is unwise. In nearly every case ample illumination is essential to useful accomplishment. The most successful conservation is elimination of waste of light, not reduction of use of light.

In war time human energy and financial resources are to be conserved as well as fuel. Except in the greatest emergency it is unwise to save a little coal at the expense of waste of labor or impairment of health or menace to the safety of the public. Coal saved through the improvement of lighting equipment is clear gain. To diminish lighting standards in industrial plants, offices and other places where accomplishment depends in part upon vision is to reduce accomplishment or output. In such places, therefore, lighting should not be reduced. On the contrary, an increase in the standard of lighting may be the truest economy and in the best interests of the nation. The liberal use of light for protection of important property, munition factories, public works, etc., is likewise in the public interest, and under present circumstances no attempt should be made to save fuel through the reduction of such lighting.

In an acute local fuel situation an absolute lack of fuel may result in largely curtailed activities. If there is no fuel, industry must cease. Such a critical situation obviously demands radical curtailment of lighting beyond anything which is contemplated for general adoption.

In certain localities in the height of winter there may be a power shortage due to abnormally taxed generating capacity. This likewise may necessitate local lighting restrictions of a more extreme character.

In either event, when such a situation occurs, the problem is a local one, the handling of which must be governed by the particular circumstances.

MAXIMUM USE OF DAYLIGHT SAVES ENERGY

Referring to the use of daylight, the committee says:

Use daylight during the war in preference to artificial light wherever and whenever possible.

Raise the shades to let in the daylight instead of lighting lamps. Arrange window shades to admit maximum daylight when desired. A good arrangement is to have two rollers at the middle of the window, one drawing up and the other down.

Refracting and diffusing glass in windows helps to spread the light to distant parts of the room.

Carry out operations requiring strong illumination near windows where plenty of daylight is available. Arrange

*Underlying the accepted principles of illumination are requirements for safety, conservation of vision, esthetics, comfort, convenience and economy. The Illuminating Engineering Society is committed to the preservation of these principles and to their application in lighting practice in the public interest. A number of recommendations here presented, particularly those advocating decreased use of light, are calculated to save fuel rather than to bring about most desirable illumination conditions. These are to be regarded solely as a war measure, justifiable in the present emergency, but otherwise not to be approved.

machinery, furniture, etc., so daylight falls on objects to be seen, not on eyes.

Whitened surfaces on building exteriors (especially about courts of high buildings) give more and better daylight in opposite buildings. These may reduce the period of artificial lighting by several hours each day.

Keep windows and skylights clean. Dirty windows may absorb half the daylight.

Dust window screens frequently. Remove them as soon as the insect season is passed. They absorb one-third of the daylight.

Use light-colored ceilings and walls wherever practicable to conserve daylight and artificial light.

Areas at a distance from windows often require artificial light when natural lighting is sufficient near the windows. Connect the switches, if possible, so that the light sources may be turned on in rows parallel with the windows, and the artificial lighting thus used in the several sections only as is necessary. Place the responsibility of operating these switches on designated individuals.

USELESS, EXCESSIVE OR DECORATIVE LIGHTING NOT PATRIOTIC

Useless lighting caused by failure to turn off lamps when not needed is also a great cause of waste and can be eliminated to a great extent by inviting the coöperation of the occupants of the place, attendants, etc. This will be discussed later with relation to different installations.

In regard to excessive and display lighting the committee says:

Do not use lamps which contribute merely to decoration.

Do not use more lamps or larger lamps than necessary.

Do not use all the lamps when part of them will suffice.

Extravagance in war time is unpatriotic. It involves application for selfish purposes of money and energy necessary to winning the war. Lighting in excess of that which is necessary and lighting for needless display or decoration at such a time is extravagant.

The question of illuminated advertising display is a part of the larger question of general advertising, practically all of which involves consumption of fuel. The desirability of curtailing lighting of this character would appear to depend upon the necessity of reducing advertising in general.

Proper lighting display has a place in maintaining the morale of the people no less important than amusements and recreation. Display lighting also has a certain utility in providing necessary illumination. General and needlessly extensive display and inefficient methods of lighting display under present conditions are extravagant. In planning lighting of this character every economy of energy not inconsistent with reasonable effectiveness of the lighting should be sought.

Maintaining the most efficient use of artificial lighting requires in the first place the employment of the most efficient lighting units; second, their proper location; third, the correct application of reflectors and shades; fourth, a high utilization factor, and, fifth, proper maintenance of the equipment and reflecting surfaces.

EFFICIENCY AND LOCATION OF LAMPS IMPORTANT

With relation to the type of lighting unit to use the committee says:

Large lamps are usually more efficient than small lamps, and where practicable installation should be altered to consist of the fewest lamps from which uniform illumination may be obtained under the conditions of use. Where clusters of lamps are employed under shades replace them by a single larger lamp with suitable reflector.

Do not use electric lamps of the carbon-filament type where the more efficient tungsten-filament lamps can be employed. These substitutions will result in a saving of three-fourths of the fuel used for a given candlepower.

An intelligent choice of lamps makes it possible to reduce the consumption of fuel.

Lamps should be spaced to give uniform lighting and with reference to the work so as to avoid bad shadows. This permits the use of the minimum wattage in the general lighting and makes it possible to remove most drop lamps and local lighting. The latter are objectionable from the conservation point of view because they may be left burning when no necessity exists.

FACTORS GOVERNING USE OF SHADES AND REFLECTORS

Regarding the general use of shades and reflectors the report reads:

Modern lamps are so brilliant that they may injure the eyes if used without protective equipment. Shades and globes conceal them from view, soften the light, and where desired redirect a considerable part of the light in the direction needed. Shades and globes never increase the total quantity of light, but an efficient reflector will usually increase the light where it is needed. With such a reflector a smaller lamp may suffice, thus saving coal. The advice of the lighting company should be sought when selecting such equipment.

Flat reflectors allow much of the light to escape to the walls instead of directing it to the work. They also leave the bright light source exposed to view and the glare interferes with the vision, causing a demand for still higher intensities. Use reflectors of the dome or bowl shapes for greatest economy. Except where lamps are mounted in high bay areas use bowl-frosted lamps to reduce glare reflected from the work and to soften the shadows. Be sure that reflectors are deep enough to protect the eye from the glare of the filament.

Do not use indirect or semi-indirect lighting fixtures in conjunction with dark ceilings which absorb a large part of the light.

LIGHT-COLORED WALLS AND CEILINGS SAVE ENERGY

As a rule, at least one-half, and sometimes practically all, of the light utilized in interiors is received by reflection from walls and ceilings. Good light-tinted paint when fresh rarely reflects more than one-half of the light which falls upon it. The proportion of light reflected from good white lead and oil paint under average conditions diminishes by about 10 per cent a year. The same is true of calcimine and similar coatings. It is apparent therefore that there is an opportunity for improving lighting efficiency through the employment of the best finishes for ceilings and upper walls. Painting white ordinary light-tinted surfaces may increase the light reflection by as much as 50 per cent. Therefore in order to save fuel in lighting wherever it is practicable paint ceilings white, employ light tints for the upper parts of walls, and use paint that is non-porous and easily cleaned. Light-colored surfaces reflect five to ten times as much light as dark surfaces.

CLEANING TOO OFTEN OVERLOOKED

Maintenance of lighting fixtures and reflecting surfaces such as walls, ceilings, etc., is so often neglected that particular attention should be directed to it as a means of saving fuel. The report on "War-Time Lighting Economies" reads:

The loss of artificial light due to dirty glassware and dark or dingy ceilings and side walls ranges from 30 to 50 per cent and may be avoided by renovation at necessary intervals. With indirect or semi-indirect lighting the refinishing of the ceiling and cleaning of the lighting units

will frequently increase the intensity 50 to 100 per cent, permitting a reduction in wattage to the next lower size of lamp.

Keep lamps and reflectors free from dust by a regular schedule of cleaning at short intervals.

SUGGESTIONS APPLYING TO SPECIFIC CASES

The foregoing suggestions apply to all places and may be considered the fundamental requirements of economical lighting. However, many places have conditions which are peculiar to them so additional factors have to be considered. A few of these will be taken up that apply to stores, hotels, offices and schoolrooms, and industrial plants.

Quoting from the I. E. S. report:

Stores.—The amount of fuel consumed in store lighting is of sufficient magnitude to make a consideration of possible economies worth while.

Illumination in stores should be only that necessary to enable customers to see comfortably and plainly even where the closest discrimination is required to the end that they may make selections and judgments quickly and satisfactorily and to enable salespeople to perform their duties quickly and easily. The degree of illumination suitable for any particular case may be determined by actual trial through the use of more or fewer lamps or of lamps of greater or less power.

Lamps should be so controlled that only those actually needed will be in use at any time. In small stores this may be accomplished by controlling each individual lamp or cluster of lamps at the fixture. In larger stores the lamps farthest removed from the windows should be on separate circuits, being switched on first as daylight diminishes, the outer lamps being turned on later when this becomes necessary.

Show windows should be lighted by lamps with efficient reflectors. By the use of these it is often possible to save from 25 to 50 per cent of the energy required for illumination without impairing the illumination in the window. Under no circumstances should bare lamps be visible from the street as this renders the eye less sensitive and makes a higher intensity necessary in the interior of the store, thus defeating the purposes for which these economies are urged.

Hotels.—It is suggested that waste in guest rooms be reduced to a minimum by having a notice, probably a card, placed near the door reading: "It is requested by the U. S. Fuel Administration that you kindly turn off the lights when leaving the room and help save fuel."

All employees of the hotel, especially the housekeepers having charge of the guest rooms, should be cautioned to see that lamps are not left burning when rooms are unoccupied and that when rooms are being cleaned only necessary lights are turned on. Bell boys should be instructed to turn on only the main or overhead lamp when showing the guest his room.

In dining rooms where two systems of lighting are in use, such as overhead and table lighting, one of the two should be reduced or eliminated entirely. Where overhead lighting is sufficient, table lamps solely for decorative effects should be done away with.

In public rooms, such as cafés, lobbies, writing rooms, etc., the illumination should be reduced to a point consistent with comfort. All decorative lamps, around mirrors or on brackets, etc., not absolutely essential to produce illumination of a sufficient intensity to avoid feeling of undue depression or gloom, should be eliminated.

While it is important as a measure of safety to keep stairways, passageways and halls adequately illuminated, it should be remembered that hall lights burn long hours, and in cases where convenience or safety is not menaced reductions as to the number and size of lamps must be made.

Service rooms where lamps are allowed to burn constantly should receive consideration; for example, in large barber shops where only a few chairs are in use lights over the other chairs should be turned off. In the kitchen only those parts of the room actually being used for preparation of food, washing the dishes and the like should be lighted.

Offices and Schools.—Very large economies in the operation of lighting systems in offices and schools may be effected without reducing the general illumination, which is seldom of an intensity higher than that required for the conservation of vision.

Often the greatest waste occurs through the lighting of an unnecessarily large number of rooms during the hours of cleaning. Every building superintendent and janitor should insist that lamps be lighted in a given area only when the cleaners are actively engaged there, and that the minimum number be turned on which will permit the work to be done properly.

Cards or signs should be displayed prominently in the various rooms requesting tenants to turn on only such lamps as are necessary to their work and urging that all lamps be extinguished when daylight will suffice and when the tenant leaves his office.

Large reflecting fixtures with glass diffusing bowls suspended below the lamps soften the shadows and reduce the demand for local desk lighting. Indirect and semi-indirect fixtures produce the best conditions for vision in schoolrooms and offices.

In offices and schoolrooms the requirements of vision are exacting. The occupants must view fine detail and the work in one position for long periods. The light from a lamp therefore enters the eye constantly from one direction and will prove annoying and harmful if too bright. Reflections from polished surfaces and sharp shadows also interfere with vision. If the general illumination is from amply diffused sources of proper wattage, all individual desk lamps may be dispensed with.

Industrial Plants.†—In almost every plant there is waste in the use of light, the elimination of which can be accomplished without retarding production, impairing the vision or menacing the safety of the employees. So far as possible do all lighting from a general overhead system out of the control of individual workmen. Make some individual in each department responsible for seeing to it that lamps are lighted only in such areas and for such periods as necessary.

ORDINARY VALUES OF ILLUMINATION EMPLOYED AND MINIMUM VALUES THAT SHOULD BE PERMITTED

	Foot-Candles at the Work— Ordinary Practice	Minimum
(a) Roadways and yard thoroughfares..	0.05- 0.25	0.02
(b) Storage spaces	0.50- 1.00	0.25
(c) Stairways, passageways, aisles.....	0.75- 2.00	0.25
(d) Rough manufacturing, such as rough machining, rough assembling, rough bench work	2.00- 4.00	1.25
(e) Rough manufacturing involving closer discrimination of detail.....	3.00- 6.00	2.00
(f) Fine manufacturing such as fine lathe work, pattern and tool making, light-colored textiles	4.00- 8.00	3.00
(g) Special cases of fine work, such as watch making, engraving, drafting, dark-colored textiles	10.00-15.00	5.00
(h) Office work, such as accounting, typewriting, etc.	4.00- 8.00	3.00

NOTE.—Measurements of illumination are to be made at the work with a properly standardized portable photometer.

This table of lighting intensities required in industrial processes was issued by the Illuminating Engineering Society and subsequently adopted by the United States Bureau of Standards for the National Safety Code and government plants. The table has likewise been incorporated in the factory lighting codes or regulations issued by several of the state industrial commissions.

†For information in regard to good factory lighting practice consult the "Code of Lighting Factories, Mills and Other Work Places," Illuminating Engineering Society.

Plant Arrangement and Costs of Construction—II

Features of Latest Station of Turners Falls Power & Electric Company, Which Bids Fair to Be One of the Most Important Steam Plants in the New England States

As pointed out in the Oct. 26 issue of the ELECTRICAL WORLD, the Turners Falls Power & Electric Company, which operates 500 miles of transmission and distribution line in the central Connecticut valley, has just built a 30,000-kw. steam station to supplement its hydroelectric plants. The new station is not for auxiliary service in the sense that it will be used merely in an emergency, but has been built to permit utilizing the maximum water power. It is an excellent example of a plant built to operate most economically. The conditions which led to its location, the obstacles which had to be overcome in building it and the method of handling the coal and ashes were related in the October issue. Additional information, including the electrical features of e plant, is given in the article which follows.

CONDENSING water is drawn from the Connecticut River through two tunnels and headworks on the banks of the stream and is discharged through a reinforced-concrete line into a lagoon connected with the Connecticut River about 500 ft. (150 m.) below the intake. The headworks structure is provided with steel racks at its entrance, heavy wooden sluicegates and stop planks to allow the making of repairs while the plant is in operation. The construction of the condenser tunnels was one of the most difficult portions of the work, involving the driving of a wooden pile foundation and the placing of concrete at an elevation of 10 ft. to 12 ft. (3 m. to 3.7 m.) below extreme low water of the river. It was necessary to surround the work with a steel cofferdam to prevent the caving in of the banks of the excavation and exclude water while the work was in progress. The discharge line was constructed at a higher elevation than the intake lines and consequently involved less difficult and expensive construction. The entire cost of condenser and intake headworks, tunnels and discharge conduit was $100,399.

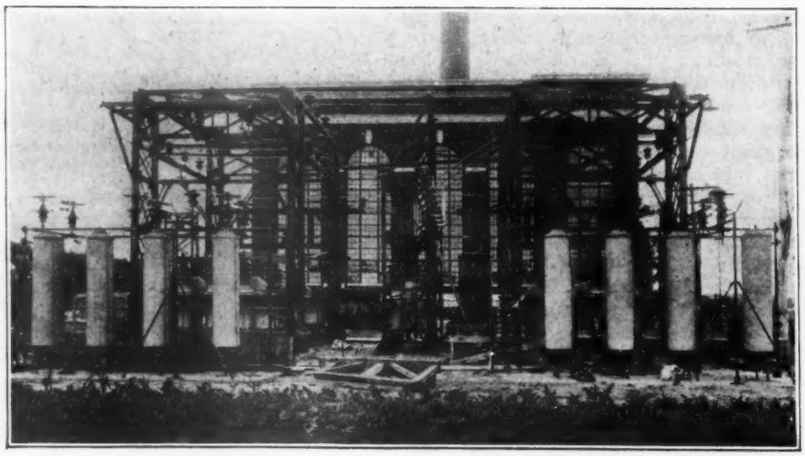


FIG. 1—OUTDOOR SUBSTATION CONNECTING STEAM STATION WITH HYDROELECTRIC TRANSMISSION SYSTEM

The boiler-feed pumps are in the turbine-room basement. Three sets have been installed. One set is driven by a General Electric induction motor of 200-hp. rating and is composed of a 3-in. (8-cm.) six-stage De Laval pump on one end of a shaft and a 4-in. (10-cm.) single-stage pump on the other end, each designed for a delivery of 300 gal. (1135 l.) per minute. The other two sets are direct-driven by De Laval turbines and are arranged in pairs, one being a 5-in. (13-cm.) three-stage pump and the other a 5-in. single-stage pump. The feed-water supply is flexibly arranged. Normally water is drawn from the hot-well suction main by the feed-pump equipment and forced through the feed-water heater and thence through a Lea V-notch meter—capacity 400,000 lb. (181,000 kg.) per hour—to the boiler supply lines. One feed pump in each set is designed for low-pressure service, delivering water into the heater, and the other pump of the set is for high-pressure service, discharging water into the boilers. A connection is made to the city water supply through a cold-water line, while a connection from the river enables water to be pumped into the hot-well suction main for make-up service. Semi-steel piping is used in the hot-water lines and wrought-iron in the cold-water lines.

Each feed-water heater has a normal capacity of 7500 hp., receiving water at a temperature of 40 deg. Fahr. (5 deg. C.) and delivering it to the boiler supply lines at 210 deg. Fahr. (99 deg. C.). A purifying attachment is provided, and the time for a complete treatment of the water, assuming a consumption of 225,000 lb. (102,000 kg.) per hour, is about fifteen minutes per heater.

Each boiler delivers steam through a side outlet to a pipe which is carried downward to the basement and thence across to a short 20-in. (51-cm.) header of cast steel 1⅛ in. (29 mm.) thick near the turbine-room wall. The turbines are each supplied from the header through an independent 14-in. (36-cm.) lead of extra-heavy cast-steel pipe. The fact that the boiler-room firing aisle is 25 ft. (7.6 m.) wide between batteries increases the length of high-pressure piping slightly, but it was thought that the increased convenience of a liberally designed boiler room was worth far more than its additional cost. A free exhaust line is carried upward from the basement to a roof outlet, as shown in the cross-section printed in the Oct. 26 issue.

Each of the two turbine sets ordered for the initial installation is a 15,000-kw. horizontal unit running 1800 r.p.m., and delivering three-phase, 60-cycle energy at 13,200 volts. The steam guarantee on these machines is 12.5 lb. per kilowatt-hour at 15,000 kw., 12.3

lb. at 11,250 kw., and 12.9 lb. at 7500 kw., the steam pressure at the throttle being 200 lb. (14 kg.) with 125 deg. superheat and not over 1.5 in. (38 mm.) absolute back pressure. Each machine is provided with a 100-kw., 250-volt direct-connected exciter. One 150-hp. motor-driven exciter is provided as a spare for both main units.

The turbine-room crane has a main hoist of 60 tons capacity and an auxiliary hoist of 6 tons rating. The maximum lift is 62 ft. (18.9 m.) It is operated by General Electric three-phase 550-volt motors, and serves the entire turbine room and basement well containing the condensing and auxiliary pumping and electrical equipment. Each turbine exhausts into a cylindrical-shell twin-jet condenser equipped with twin submerged removal pumps connected through Kerr reduction gears to General Electric turbines. Air removal is accomplished by four "Radojet" ejectors per condenser. The condensers are designed to maintain a 28-in. (71-mm.) vacuum at the turbine exhaust nozzle under full-load conditions with injection water at 70 deg. Fahr. (21 deg. C.). The circulating pumps have a working range enabling them to discharge against the maximum head obtained at high river elevations. The water removal pumps are 24-in. (61-cm.) bi-rotor centrifugals, and each has a capacity of 12,200 gal. (46,200 l.) per minute. Each turbine and gear set has a rating of 250 hp. at about 3000 r.p.m., and the pumps are installed in the hot wells under the condenser shells.

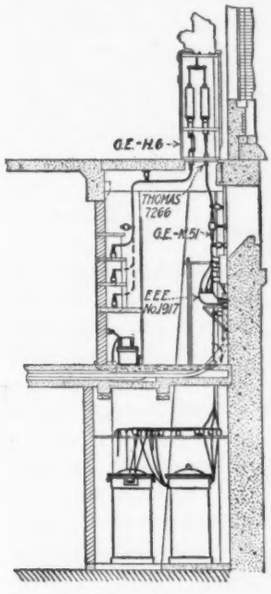


FIG. 2—SECTION THROUGH BUS AND SWITCH STRUCTURE

CONSTRUCTION OF HOT WELLS FOR GENERATORS

The hot well for each generating unit is divided into two sections separated by a weir. From each condenser a pair of 24-in. (61-cm.) pipes lead through the hot well to a conduit terminating in a discharge pit, from which a discharge main carries away the unused water to the river. Over one section of the hot well each of these condensate pipes is tapped by an 8-in. (20-cm.) pipe which delivers condensate to another section of the hot well, the amount delivered depending upon the load and upon the degree of opening of a float valve in each 8-in. pipe. The four Radojet air ejectors for each condenser take boiler steam through a reducing valve. The steam, together with the air removed from the condensers, is discharged through 5-in. (13-cm.) perforated pipes into the hot well. The float valve in the condenser-water branch discharge line keeps the water in the hot well at a constant level. After the water flows over the weir into the other section of the hot well, it is drawn through the suction line to the feed pumps and thence delivered to the heaters. The condenser injection piping is provided with a high-water by-pass loop 9 ft. (2.7 m.) high for each unit to protect the condenser from flooding at times of a high water. The hot wells are provided with overflow connections to a basement sump. Each of the Radojet air ejectors is designed to remove 13.5 cu.ft. (0.38 cu.m.) of air per minute, with a steam consumption not exceeding 1800 lb. (815 kg.) per ejector.

The generators are equipped with temperature coils, and the stator neutrals are brought out for current transformer connections to guard against short-circuit conditions. At present the connections from the generators to the controlling 13,200-volt switches are temporary. These switches are placed in brick cells on the turbine-room floor and on a basement mezzanine floor just below. The switches are operated by remote-control from a temporary switchboard on the turbine-room floor. This location will later be changed as the plant increases in size, and a separate switch house will be erected on the north side of the turbine room, situated symmetrically with respect to the final installation of generators. Ducts are now laid in the turbine-room floor with this end in view.

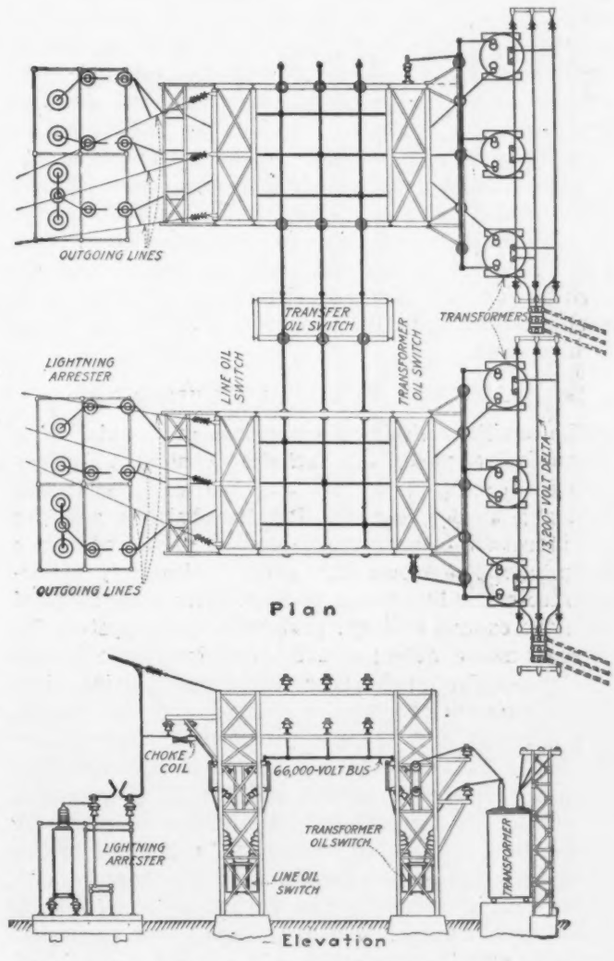


FIG. 3—PLAN AND ELEVATION OF OUTDOOR SUBSTATION; TRANSFORMER MAY BE PARALLELED ON HIGH-TENSION SIDE

All high-voltage line and transformer switches are in the outdoor substation, which is equipped with six 6250-kva. Westinghouse oil-insulated, water-cooled transformers mounted in two banks of three each, with primary and secondary connections as shown in the ac-

companying drawing. The transformer water-cooling coils are connected with the house service system, and the oil piping is connected to an underground tank and filtering system conveniently placed with respect to the substation. There are two outgoing 66,000-volt lines. The 13,200-volt buses are arranged in a single set in horizontal runways in the mezzanine floor of the turbine-room basement and are connected through General Electric motor-operated H-6 oil switches to the transformer banks by two underground cable duct lines. Each line consists of three armored cables made up in three 400,000-circ. mil sections per cable, three phases of each circuit being carried in each cable. A spacing of 10 in. (25 cm.) of earth is left between each two armored cables.

The 13,200-volt connections of the outdoor transformers are in delta and the 66,000-volt connections in Y, with the neutral grounded. No strain insulators are provided on the high-tension buses of the substation, all construction being of the rigid type, with pin-type insulators and bus conductors of 1.25-in. (32-mm.) double extra-heavy steel pipe. The outdoor bus affords opportunity for cross-connecting the two outgoing lines, feeding either from either transformer bank or from both banks in multiple. The bus-tie switch permits short-circuiting the station on the high-tension side if desired, leaving the transformer banks dead. Tracks are provided for the removal of transformers. The usual installation of lightning arresters, choke coils and disconnecting switches has been made. All the high-tension switches are electrically operated with remote control from the temporary switchboard in the turbine room.

Auxiliary Electrical Equipment

The auxiliary electrical equipment of the station is unusually complete. It includes a storage battery for the operation of oil switches and emergency lighting; a charging set for the battery and for the industrial electric truck used in ash handling; a 25-hp. air compressor for general cleaning; motor-operated steam-line valves of 3-hp. drive each, supplied from the control battery; push-button stop system for conveyor-motor drive; a 200-hp. motor-driven boiler-feed pump for combination turbo-motor drive; two 15-hp. motor-driven service pumps, and five house-service power and lighting transformers aggregating 850 kva. The house power service is performed by 550-volt, three-phase motors, and the lighting service is operated on the 110-220-volt, three-wire plan. A wooden tank is installed on the roof and piped to the house-service pumps for general water supply and transformer-cooling service. The station-service 550-volt, three-phase buses are of 1-in. (25-mm.) rods supported on cleats and insulated with ½-in. (3-mm.) varnished cambric wrapped with flame-proof covering. The station-service transformers and storage battery for control service are in permanent compartments of the basement below the present temporary 13,200-volt bus compartment. An office for the station executive staff is provided in an "L" on the Connecticut River side of the building.

The Hampden station was designed under the general direction of F. L. Hunt, chief engineer; C. F. Mosher, superintendent of stations, and R. E. Barrett, of the Turners Falls Power & Electric Company, Mr. Barrett being resident construction engineer with headquarters at Springfield, Mass. The company's engineering and operating headquarters are at Greenfield, Mass. George W. Lawrence, Greenfield, Mass., is second vice-president and general manager of the company.

The president of the Turners Falls Power & Electric Company is Philip Cabot of White, Weld & Company, Boston, whose financial and engineering leadership has been the most important factor in the development of the company's system from its early beginnings to its present magnitude as a public utility of foremost importance in supplying electrical energy to the public and the manufacturers of the New England States.

Book Review

ELEMENTS OF FUEL OIL AND STEAM ENGINEERING. A Practical Treatise Dealing with Fuel Oil, for the Central-Station Man, the Power-Plant Operator, the Mechanical Engineer and the Student. By Robert Sibley and Charles H. Delany. San Francisco: Technical Publishing Company. 320 pages, illustrated. Price, $3.

The greater part of this book is devoted to the fundamentals of steam engineering, and the burning of oil fuel is not treated so extensively as could be desired. For example, almost half of the thirty chapters are given over to the treatment of such topics as force, work and power; gage and absolute pressures and pressure measurements; temperature scales and their conversion; elementary thermodynamics, including an explanation of the properties of steam and the use of the steam table; calculation of boiler horsepower; steam calorimeters and the determination of the quality of steam; types of steam boilers; strength of boiler shells and riveted joints, and apparatus for flue-gas analysis. All of these matters are of general application in connection with steam-boiler practice. On the other hand, the chapter describing furnaces for fuel oil and showing the different methods of admitting the air supply is excellent.

The number of types of oil burners shown is limited to four, which is somewhat surprising in view of the number of such devices on the market. Apparatus for finding the gravity, moisture content and heating value of fuel oils, testing boilers and working up the results of tests are written specifically with regard to fuel-oil practice. No mention is made of oil strainers or heaters, so far as illustrations are concerned, and little is said with regard to oil storage. The oil-fuel data that are presented are practical and useful, and it is regrettable that the various topics relating thereto are not more extensively treated.

Books Received

THE NEW SCIENCE OF THE FUNDAMENTAL PHYSICS. By W. W. Strong. Mechanicsburg, Pa.: S. I. E. M. Company. 108 pages.

THE RESULTS OF MUNICIPAL ELECTRIC LIGHTING IN MASSACHUSETTS. By E. E. Lincoln. New York: Houghton Mifflin Company. 484 pages. Price, $3.

STATION & OPERATING PRACTICE

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

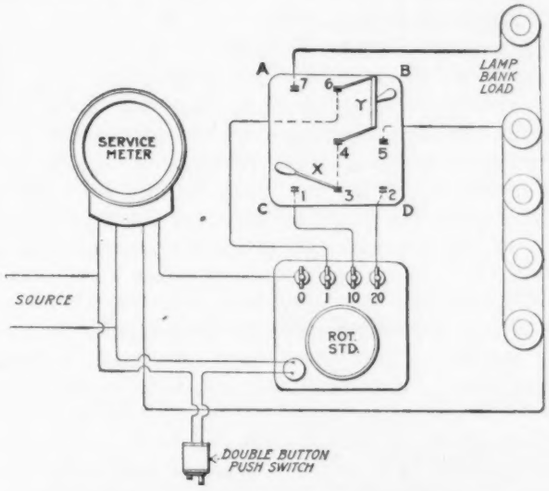
SPECIAL SWITCH MADE FOR TESTING WATT-HOUR METERS

Saves Time and Prevents Mistakes in Changing Current Coil Connections—Easily Made from Switch Parts

BY R. M. BERRY

A convenient method of testing watt-hour meters is indicated by the accompanying drawing. The part of the diagram shown at *ABCD* represents a specially constructed switch for changing the current coils on the rotating standard without having to remove the wire from one binding post to the other during the period of testing a meter. This switch has been found to be quite a time saver and helps to eliminate mistakes.

The operation of the switch is as follows: For testing with the 20-amp. coil on the rotating standard, adjust the load for 20 amp., throw switches *X* and *Y* toward *BD* and connect points 2 to 3 and 4 to 5 respectively, thus completing the circuit through the 20-amp. coil. In a like manner, for testing with the 10-amp.



SPECIAL SWITCH FOR TESTING WATT-HOUR METERS

coil, adjust the load for 10 amp., leave switch *Y* in position *BD* and throw switch *X* toward *AC*, connecting points 1 to 3 and 4 to 5 and completing the circuit through the 10-amp. coil. In testing with the 1-amp. coil switch *Y* is thrown toward *AC*, connecting points 6 to 7 and completing the circuit through the 1-amp. coil.

The idea in having switch *Y* of the construction mentioned is to avoid blowing the fuse on the 1-amp. coil, as only a definite load can be placed on it. When using the other coils the latter is entirely disconnected. This switch was constructed out of fiber board of ⅛-in. (3-mm.) thickness for the base and standard knife-switch parts for the contacts. This switch can be mounted in any convenient place for shop testing, or a special cover can be made for the rotating standard deep enough to accommodate the switch when the cover is closed.

PERFORMANCE DATA ON A BRASS-MELTING FURNACE

Comparison of an Electric Furnace with an Oil-Fired Furnace Shows a Considerable Saving in Heating Units as Well as Metal Loss

Data are presented herewith on the performance of a Bailey brass-melting furnace at Louisville, Ky., indicating that 5.9 lb. (2.6 kg.) of metal loss and 233,000 B.t.u. are saved per 100 lb. (45 kg.) of metal poured, compared with using an oil-fired furnace. The figures are based on an eight-day run of yellow brass at the plant of the Standard Sanitary Manufacturing Company, Louisville. A. S. Witmer, manager of the commercial department of the Louisville Gas & Electric Company, submitted the information.

REPORT OF TEST MADE ON A BAILEY ELECTRIC FURNACE MELTING YELLOW BRASS

Date	Metal Charges, Lb.	Metal Poured, Lb.	Loss, Lb.	Gain, Lb.	Kw.-Hr.
July 8	3,000	2,950	50	...	508
9	5,000	4,748½	251½	...	795
10	6,020	5,835	185	...	644
11	6,000	5,943½	56½	...	639
12	5,900	5,032	...	32	733
13	2,400	2,532	...	132	309
15	5,822	5,809	13	...	724
16	6,000	5,945	55	...	705
Totals,	40,142	39,695	611	164	5,057
Net loss,	.....	.....	164	...	....
			447		

SUMMARY

Energy per 100 lb. of metal poured, 12.7 kw.-hr

Metal loss per 100 lb. of metal poured, 1.13 lb.

Cost per 100 lb. of metal poured:		
Energy, 12.7 kw.-hr., at 1½ cents	$0.19	
Metal loss, 1.13 lb., at 20 cents	0.226	
		$0.416

RESULTS USUALLY OBTAINED BY OIL FURNACE

Oil per 100 lb. of metal poured, 4 gal.

Metal loss per 100 lb. of metal poured, 7 gal.

Cost per 100 lb. of metal poured:		
Oil (4 gal., at 6 cents)	$0.24	
Metal loss (7 lb., at 20 cents)	1.40	
		$1.64

ECONOMY OF FUEL

Assuming a power plant consumption of 3 lb. coal per kw.-hr., and a value of $3 per ton, and oil at 6 cents per gal., the following results based on 100 lb. of metal poured are obtained:

Oil furnace (4 gal. oil, at 6 cents)	$0.240
Electric furnace, 12.7 kw.-hr. × 3 lb., at $3 per ton	.057
Value of fuel saved	$0.183

ECONOMY OF METAL

	Lb.
Oil furnace loss per 100 lb. metal poured	7.00
Electric furnace loss per 100 lb. metal poured	1.13
Metal saved	5.87

ECONOMY OF HEATING UNITS

	B.t.u.
Oil furnace (4 gal. oil × 177,000)	708,000
Electric furnace (38 lb. coal × 12,500)	475,000
Saving	233,000

CARD SYSTEM THAT GIVES RECORD OF ALL MOTORS

Facilitates Keeping Proper Repair Parts on Hand, Simplifies Handling Emergency Calls, Insures Thorough Maintenance

BY H. S. RICH

In a large plant where more than 100 motors are installed much delay was experienced in answering breakdown calls and in making repairs through lack of knowledge of each particular motor. One of the first things done by a new chief electrician was to have all motors cleaned up and numbered plainly. Then he established a card system on which were kept all the specifications concerning each motor. These cards were kept in an open box on his desk in the electric repair shop, where all the helpers could refer to them instantly. Each card showed the following:

Number of motor.	Department.
Horsepower.	Revolutions.
Make.	Phase.
Manufacturer's number.	Diameter of pulley.
Face of pulley.	Diameter of shaft.
Length of shaft.	Size of key.
Type.	Serial number.
Size of fuses.	Type of fuses.
Size and number of brushes.	Motor belted to.

The cards were arranged in the box by departments so that by referring to any one department all the motors in there could be seen at a glance. A few cards at the front of the pile had all the motors in the plant arranged by numbers consecutively, so that when any foreman telephoned in, for instance, that motor No. 15 was stopped the top cards showed what department this motor was in. Then by referring to the department card all the specifications concerning this motor were seen at a glance, and the repair man was supplied with the proper-sized fuses, test lamp and tools and dispatched to remedy the trouble.

Most jobs were completed in record time because the necessary things were taken along on the first trip, without running back and forth to see what was wanted, all of which formerly caused much delay. By "keeping tabs" on the cards all sizes of fuses likely to be needed by any motor could be provided ahead of time and kept in stock, so that no time was lost making up any when a motor shut down.

This card system was very handy to refer to when a motor burned out or broke down. Moreover, motors could be shifted around to better advantage by knowing all about them. Thus one department needed more horsepower and another department was found to have a larger motor at the same speed and pulley diameter. After seeing them both in operation an exchange was made with all knowledge of the details before either was stopped. Many times an exchange or temporary installation called for special-sized pulley with a particular bore and key. The card data made possible the assembly of this material ahead of time so that when the change was made there was no loss of time.

All new motors purchased, whether put into immediate use or into stock as reserves, had their record taken and listed along with the rest of the equipment on hand. In a space at the bottom of every motor card remarks were often penciled from time to time as trouble was found. Thus one busy 50-hp. motor was found to have very little clearance under the rotor when tested with a steel gage. This was noted on its card, and two new bearing linings were immediately made ready. On the first Saturday afternoon following, when the motor was shut down, the linings were examined and one was found to be badly worn. A new one was put in, and on Monday morning everything was ready for service with no loss of time.

Sometimes higher line-shaft speed was demanded, and by referring to the card the revolutions, pulley diameter, face and key were observed at a glance. A larger one could be made ready and slipped on the same day at noon; whereas to climb a ladder and take measures might have meant to shut down a motor which was carrying a large load; thus production would be curtailed. The time saved is the most valuable feature of this scheme.

When summer repairs are made each motor is taken in its turn and thoroughly overhauled. By following the cards none is overlooked. Also by listing the various sizes of shafts throughout the plant enough bearing linings can be ordered ahead of time and kept in stock so that no motor will be held up in an emergency for lack of them.

PROBLEM OF CORROSION OF BOILER-FEED PIPES

Increased by Dissolved Gases in Liquid—Presence of Hydrogen Ions and Roll Scale Tends to Augment the Trouble

The activity with which corrosion takes place in hot-water supply pipes like boiler-feed lines and economizer tubes is not primarily dependent upon the acid, alkaline or neutral condition of a water, but rather upon certain dissolved substances which exert a modifying influence upon the universal tendency of even the purest water to initiate the corrosion process. So say F. N. Speller and R. G. Knowland of the American Society of Heating and Ventilating Engineers. This inherent tendency of pure water to attack metal may be greatly aided by dissolved gases in the liquid, and under such conditions the term "active" typifies its corrosive qualities. The initial speed of attack is proportional to the number of hydrogen ions in the water. While pure water, with its very low concentration of acid ions, is capable of inducing the corrosion of iron water containing an acid will be proportionately more ruinous to the metal. It is, therefore, a fact that the tendency of iron to corrode depends to a certain degree upon the amount of acid present in the surrounding water.

In the first stage of corrosion iron surfaces have the appearance of ferrous compound; this will stop further action unless removed. The presence or absence of oxygen determines the possibility of corrosion. Thus an inactive water may become extremely corrosive or active upon being aërated. The controlling factor which exposes either steel or wrought-iron pipe to corrosion by dissolved gases in hot water lines is the roll scale. If this is removed by mechanical processes, the rate of corrosion is diminished to about 20 per cent of the rate for pipe carrying the usual covering of roll scale. This means an increase of about 400 per cent in the length of service.

CENTRAL STATION SERVICE

A Department Devoted to Commercial Policy and Management Topics, Including Applications of Electric Light, Power and Heat

TRAINED NURSES VISIT VICTIMS OF INFLUENZA

Philadelphia Electric Company Has Had Four Nurses Visiting Families of Employees Suffering from Epidemic

Probably no welfare work ever undertaken by the Philadelphia Electric Company has been so thoroughly appreciated as its action in employing trained nurses to visit employees and their families suffering from the influenza epidemic, it was stated in the weekly bulletin, the *Current News*, published by the company section of the N. E. L. A.

This work, which began on Sunday, Oct. 6, was started by Thomas Sproule, who is in charge of the overhead-line construction department of the company. He has worked unselfishly and untiringly in its behalf. Four nurses each visited for a time from fifteen to thirty families each day. The reception which they had, particularly in those families where most of the members were afflicted, was, as one nurse expresses it, "impossible to describe." In a number of instances whole families were found afflicted with no one to care for them. Through the coöperation of the company prompt assistance was furnished in every severe case. Dozens were placed in hospitals and their cases followed each day. Where cases were promptly reported and where the instructions of the visiting nurses were carried out speedy recoveries resulted.

NEW PLAN OF SERVICE-CHARGE SCHEDULES FOR POWER LOADS

Refund of Normal Cost to Be Made from Energy Used by All on the Line at Rate Determined by Line Cost and Kilowatt Demand

A new customer's charge for commercial loads in excess of 5 kw. capacity has been drawn up by the Alliance (Ohio) Gas & Power Company, effective Nov. 1. This applies in any instance where the company is required to make an expenditure (1) for the installation or construction of switching apparatus, for additional or specific switchgear, meters, instruments, panels, frames, control, cables and buses, connections and transformers, in switch houses or substations; (2) for additional or specific overhead lines, including poles or towers, with necessary and usual equipment, wire, lightning arresters, line switches, ground wires or connections, or for any work on existing poles or towers, with all the attendant equipment for increasing the distribution system or transmitting direct to the consumers' premises; (3) for any transformers installed in switch houses, substations, line houses or other structures not otherwise specified, and (4) for service on customers' premises, for the installation of poles, power lines, ducts, cables, and also where the transformer capacity to be installed exceeds 50 kw. for the transformers and switching required and for special transformers of 50 kw. rating or less.

The company contracts to supply a given amount of kilowatt line capacity to the premises in question, and this capacity the company agrees to hold and reserve for use of the applicant ten years from the commencing of supply, subject to federal, state, county, township or municipal regulation.

How the Refund Is Worked Out

A deposit of the estimated cost of the work upon the understanding that the work shall be the property of the company is required. A refund will be made of the estimated cost of this work as of July 1, 1914 (called the normal cost), (A) on the energy used by the applicant and taken from the line constructed as specified, and (B) in addition on the energy taken and used by other consumers connected to the lines so constructed, except where the work constructed consists of feeders or an addition to the network, in the general distribution system of the company, in which event refund to the applicant will be made only on the energy used by those consumers who are connected to that part of the work specifically constructed for the applicant which extends beyond the network of the general distribution system of the company. Provision is made, however, that in no case shall the amount refunded to the applicant on the energy used by any consumer exceed the normal cost of that portion of the work constructed which is useful in serving that customer. That amount refunded to the applicant should be based upon the energy taken and used within ten years after commencement of supply, and the total amount of the refund should not exceed the normal cost of the work applied for.

Moreover, the refund will be computed at a rate per unit as determined by the following formula: Refund rate per kilowatt-hour = dollars $\div$ (36,000 $\times$ contracted kilowatt demand). The sum of the money in this formula is the normal cost of the work as described. The refund will be paid by the company to the applicant annually. The kilowatt demand in this formula is the capacity contracted for and reserved to the use of the applicant by the company.

No refund or interest shall be paid unless the applicant's bills for energy have been paid in full, nor shall any annual refund payment exceed 50 per cent of the sum of the bill for the energy used within the refund period from the work of construction under the application. Besides, the company reserves the right to refund at any time all or any part of the unrefunded portion of the normal cost of the specified work. No

refund or interest whatsoever will be allowed on the excess cost of the specified work, which excess is the difference between the normal cost and the amount deposited.

Interest not exceeding 6 per cent per annum will be paid by the company to the applicant annually upon the balance of the normal cost held at the time and subject to be refunded, and this annual rate of interest will be computed by this formula: Rate = 0.6 of 1 per cent × average hours' use per day of the contracted kilowatt demand.

The hours' use per day of the contracted kilowatt demand in this formula is to be determined by dividing the monthly average of kilowatt-hours upon which refund is allowed by thirty times the demand contracted for.

EFFECT CAUSED BY WAR ON UTILITY EMPLOYMENT

Figures for Detroit Edison Company Show an Average Annual Turnover of 125 per Cent—Average Age Increases from 31.8 to 33.6 Years

Because of the draft and voluntary enlistments, and because of higher wages offered elsewhere, electric lighting utilities are finding their labor supply in a rather fluid state at the present time. Ordinarily labor in central-station companies, particularly in large cities, is decidedly static. Figures on labor conditions with the Detroit Edison Company recently published in the

HOW SIXTEEN MONTHS OF WAR AFFECTED THE RELATIVE NUMBERS AND AGES OF EMPLOYEES

company's *Bulletin* show for a period of more than two years an annual turnover in the neighborhood of 125 per cent. These figures are shown monthly in an accompanying table. The term "labor turnover" as here used designates the total number of employees leaving the company for one reason or another during a definite time divided by the average number of employees for that specified period. The percentages shown were reduced to a yearly basis by taking the monthly turnover and multiplying by 12.

The average annual turnover is in the neighborhood of 125 per cent and takes place mainly in the construction department. Spring and fall appear to be the seasons when labor turnover is greatest. In the spring higher wages entice more men away, while in the fall a certain amount of construction is stopped and many names are dropped from the roll. The increase that took place in 1917 was due principally to two causes, the reduction in the construction force brought about by certain war conditions and the call of many of the young men into military service.

Already some 627 young men from this company have entered government service, and the accompanying curve is interesting as showing the effect of this and other losses of employees on the average age of employees. It will be noticed from the curve that very little change in the number of employees over thirty-three occurred. It is also brought out that while the average age of all employees a year ago was 31.8 years, to-day the average age is 33.6 years.

It is also interesting to note that women are taking a steadily increasing share of the work since the country entered the war, particularly in the customers' accounts, collection and payroll departments. Eighteen months ago the proportion of women in the company's service was about 10 per cent. To-day it is nearly 15 per cent of the total number employed.

FEDERAL NITRATE PLANT POWER-CONTRACT FEATURES

Government to Finance New Generating Unit Required by 30,000-Kw. to 40,000-Kw. Load and to Build and Retain Transmission Line

The Union Gas & Electric Company, Cincinnati, Ohio, has recently contracted with the United States to supply power to the nitrate plant at Cincinnati. The main features of the contract are as follows:

1. The Union company is to furnish electrical energy for the operation of the plant for a demand of not less than 30,000 kw. or more than 40,000 kw., the charge for which is to be computed on a combined demand and energy basis.

2. The contract is for a term of five years beginning not later than July 1, 1919, but the guaranteed minimum demand of 30,000 kw. may be reduced if the interests of the United States so require upon three months' notice after one year's full operation—not earlier, however, than Oct. 1, 1920.

3. The power factor guaranteed by the United States is to be not less than 85 per cent at the power house. The load factor is estimated at 90 per cent or better, and the estimated consumption of energy for the five-year period is 1,750,000,000 kw.-hr.

4. A third unit of 30,000 kw. rating, with all auxiliaries, is to be added to the present equipment of 60,000 kw. in the company's new power house. The cost of this installation will be paid by the United States and will be taken over by the power company three years after the termination of the war.

5. A 66,000-volt double transmission line, carrying four three-phase circuits, will be constructed at the cost of the United States from the company's power house to the site of the nitrate plant, a distance of approximately 15 miles, with a step-up transformer station near the power plant and a step-down transformer station at the nitrate plant. The transmission line and substations are to remain the property of the United States, thereby insuring an exclusive and permanent transmission line conveying energy from the power house to the nitrate plant.

TECHNICAL THEORY & PRACTICE

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

Generators, Motors and Transformers

Power Factor in the Resonance Transformer Circuit.—P. BAILLIE.—The assumption that all the inductance of the circuit is external to the transformer is not quite correct. A small part of this inductance equivalent to leakage is between the points where the voltmeter is connected. The measured effective voltage is therefore a little smaller than the calculated voltage. Nevertheless, this assumption gives a means of quickly estimating, within a few per cent, the power supplied to the condenser of a transmitting plant when no wattmeter is available.—*Wireless World*, October, 1918.

Generation, Transmission and Distribution

Synchronizing of Alternators.—E. STYFF.—In this article the author compares three methods of synchronizing, namely. the bright-lamp method, for which he recommends the use of carbon lamps; the dark-lamp method, for which tungsten lamps are more suitable, and a mixed scheme of synchronizing, making use of a voltmeter and bright lamps. The last-named method the author regards as the most satisfactory.—London *Electrician*, Aug. 2, 1918.

Maxima of Overpressure in Water-Hammer Phenomena.—MAURICE GARIEL.—In this first article of a series that will constitute an elaborate investigation into the phenomena of water hammer, so important in hydroelectric construction, the author inquires into the maximum of overpressure to fear at the base of the conduit when the supply to the turbine is cut off and gives formulas to apply in this case. In his subsequent investigation he will develop analogous considerations applying to water hammer along the length of the conduit, and finally he will comment on the latest studies of de Sparre into the laws of hydro installation, which should lead to the construction of regulators insuring a minimum degree of water hammer.—*Revue Générale de l'Electricité*, Sept. 21, 1918.

Electric Surges in Transformer Coils.—W. ROGOWSKI.—The mathematical calculation of the voltage rise in coils caused by surges entering them from a transmission line is one of considerable difficulty. In the present article the author considers the somewhat simple case of a coil consisting of two turns. He promises that at a later date he will extend the theory to a coil of three turns, for which case the mathematics becomes very much more complicated. The danger to the coil appears to depend greatly on the length of the transmission line connected to the coil, and the most distant point of the coil is exposed to the greatest stresses. If the line is short the rise of voltage is independent of the distance between the turns of the coil, whereas if the line is long the voltage increases greatly with the length of the line. With short lines the oscillations are damped by the resistance of the coil alone, but with long lines the line also has a damping action. The maximum voltage across the turns does not exceed the impressed voltage with a short line, but may reach twice the impressed voltage with a long line. With a short line it does not matter much whether the line is a cable or an overhead wire, but with a long line a coil might be endangered if the line is a cable, while no danger would exist if the line were an overhead one.. It may therefore be dangerous in some cases to replace overhead lines by cables. In a few words referring to the coil with many turns it is indicated that the danger point in a coil of one layer lies near the middle in the case of a flat coil and near the ends in the case of a long coil.—*Science Abstracts, Section B*, Aug. 31, 1918. (Abs. from *Archiv. f. Elektrot.*, 6. 1918.)

Calculation of Single-Phase and Three-Phase Lines.—J. R. DICK.—In this, the first paper of the series, diagrams are included from which line regulation may be determined, and from these the commonly known trigonometric functions, useful in calculating line regulation, are derived. —London *Electrician*, Sept. 20, 1918.

More Energy for Mansfield District.—A description of the new Melco plant, 13 miles southeast of Mansfield, Ohio, is given. In this plant both natural gas and coal are utilized. The location also insures continuous and abundant supply of water and fuel.—*Power Plant Engineering*, Sept. 15, 1918.

Using Exhaust Steam.—S. E. BALCOME.—In this article the value of exhaust steam, limitations of its use, effects of engine efficiency and heat available with various types of engines are considered.—*Power Plant Engineering*, Oct. 15, 1918.

Traction

Rapid Braking in Electric Railway Operation.—J. CARLIER.—Many railway companies, the author thinks, have been deterred from installing the quickest brakes because of the initial expense. He brings forward figures from American sources to show that the interest and amortisement attending such expense is much more than compensated by the increased receipts.—*Revue Générale de l'Electricité*, Sept. 7, 1918.

Installations, Systems and Appliances

Drum Shape as Affecting the Mine-Hoist Duty Cycle and Motor Rating.—F. L. STONE.—The standardization of mine hoists from an engineering standpoint is considered impossible on account of the wide variation in the conditions and methods under which anthracite coal is mined. The problem of drum shape consists in varying the diameter of different parts of the winding drum so that the load may be accelerated and retarded at the beginning and end of its travel with the minimum consumption of power. Numerical examples of the performance of drum shapes under assumed conditions are given.—*Proceedings A. I. E. E.*, October, 1918.

Preparation in the Electric Furnace of Some Metals Useful in Industry.—JEAN ESCARD.—A discussion of the application of the electric furnace in the production of alkaline and earthy metals, such as barium and calcium, which have come into industrial use, and also of chromic metals, those formerly called secondary or special, which now play an important part in the metallurgy of iron and steel. Cobalt, nickel, manganese, molybdenum and tungsten are among the metals whose treatment in the electric furnace is described.—*Revue Générale de l'Electricité,* Sept. 14, 1918.

Use of Electric Power in Mining of Anthracite Coal.—J. B. CRANE.—This paper gives figures as to the power cost and energy consumption of anthracite mines and the reasons for these being in excess of the requirements of bituminous mines. Estimates are also given as to the additional coal that will be released by the electrification of the anthracite mines. Illustrations are included showing representative installations of electric drive.—*Proceedings A. I. E. E.,* October, 1918.

New Type of Mine Locomotive Controller.—L. W. WEBB.—The type of mine locomotive controller described in this article was developed for service on large mine locomotives where the capacity of hand-operated drum controllers would be exceeded. The matter of space precludes the use of type M control with magnetically operated contactors on any but the largest mine locomotives. The pneumatic hand-operated control for electric power equipments offers compactness, but as compressed air is not available on most mine locomotives the cam feature was adopted and the cam shaft arranged for manual operation. Diagrams are included showing the connections of the two, three and four-motor controllers. This type of controller has proved so successful in operation that it is proposed to build it with seven cam units for use on 50-ton, 600-volt switching locomotives.—*General Electric Review,* September, 1918.

Electricity's Part in Building and Navigating Ships.—H. A HORNOR.—A continuation from the July issue giving a general discussion of types of drive and a comparison between three typical methods as follows: (1) A 3000-hp. geared turbine with steam auxiliaries; (2) a 3000-hp. geared turbine with two 100-kw. turbines for electric auxiliaries; (3) one 3000-kw. electric generator turbine-driven, one 3000-hp., 150-r.p.m. motor with controller and rheostat, one 100-kw. turbine-generator for auxiliaries, two 35-kw. turbine-generator exciting units, and three 75-kva. transformers to operate the electric auxiliaries from the main generators. A cost analysis is given for these three cases, together with the advantages of electric drive.—*Electrical Engineering,* August, 1918.

Electrification of a Durham Colliery.—In the first of a series of articles on this subject the control of hoisting apparatus is taken up. Conditions promoting protection of operators are described, and the emergency protection of the electrical apparatus is covered in some detail.—London *Engineer,* Aug. 16, 1918.

Interesting Alternating-Current Rectifier.—A rectifier of the vibrating-contact type is described in this article. The usefulness of this simple type of rectifier is shown for the charging of accumulators.—*Wireless World,* August, 1918.

Wires, Wiring and Conduits

Standards for Municipal Electrical Departments; Fire-Alarm Telegraph.—Specifications for underground cable giving physical tests of conductors, rubber insulation and lead sheath are given in this article. Electrical tests and methods of manufacture for fire-alarm telegraph systems are outlined, and office location. type of battery to be used and switchboard equipment are also taken up in the report.—Report to convention of Municipal Electricians at Atlanta, Ga., September, 1918.

Electrophysics and Magnetism

Mechanical Analogies to Inductively Coupled Electric Circuits.—H. M. BROWNING.—In the first article of this series the method of using interacting pendulums to demonstrate the action of oscillations in electric circuits is described. In this article the results of the theory are set forth and it will be found how closely they agree with experiment.—*Wireless World,* August, 1918.

Oscillating Energy.—G. SZARVADY.—A study of the application of Ohm's law and of the rules of Kirchhoff to the "watted" and "wattless" components of any periodic currents.—*Revue Générale de l'Electricité,* Sept. 21, 1918.

The Fourier Theorem and Developments in Trigonometric Series.—G. A. ANDRAULT.—The author, holding that the proposition of Fourier by which any periodic function may always be expressed analytically by a trigonometric series is hardly self-evident, has evolved a new method of synthetic demonstration which not only leads to the demonstration and even to the generalization of the Fourier theorem but also to theories and observations relating to an approximate representation independently of coefficients, etc. The latter possess in the new method a physical signification suggesting a practical method for their interpretation.—*Revue Générale de l'Electricité,* Sept. 7, 1918.

A Galvanic Interrupter.—W. KASPEROWICZ.—A galvanic interrupter is described in which mercury is used as the conducting fluid medium, in place of the usual electrolytic fluid. A simple arrangement consists of two insulating vessels (made of porcelain, quartz or glass), one of which slides easily in the other, and both filled with Hg. A small opening in the inner vessel allows contact, by means of a thin Hg thread, between the two Hg masses. A single vessel divided into two parts by insulating partition will answer the same purpose. A glass or quartz U-tube, the bore at the bend of which is made very small, when filled with Hg is found particularly suitable for demonstration purposes. When such an interrupter is placed in circuit with a direct or alternating current the Hg thread is vaporized when the current is of suitable strength, and a small arc is formed, the current being thus lowered considerably or even broken. Hg vapor condenses very quickly, the thread reforms, and the current is again short-circuited. The process then commences once more. The current strength required depends upon the thickness and length of the Hg thread as well as upon its form; further, the rate of loss of heat is an important factor. A mercury thread 1 mm. in diameter and several millimeters in length will, with suitable loss of heat, act as interrupter for a current of about 200 amp It is

possible also to construct a galvanic interrupter on the Wehnelt principle.—*Science Abstracts, Section A*, Aug. 1918. (Abstracted from *Phys. Zeit.*, 19, May 1, 1918.)

Electrochemistry and Batteries

Storage Batteries.—O. W. A. OETTING.—In tracing the development of storage batteries during the last four or five years the writer deals particularly with the application of these batteries to isolated lighting plants, to automobile systems of ignition, lighting and starting, and to some other applications having to do with the prosecution of the war. He states that the use of 32-volt batteries on farm-lighting systems has placed within the reach of rural communities most of the advantages commonly associated with electric service in the city. He says that the 32-volt system has become standardized owing to the short distance of distribution in isolated plants and also on account of the advantage incident to a short filament in lamps. The author states that there are some advantages in automobile ignition by battery compared with magneto ignition in that with low cranking speeds in winter time the magneto may not furnish a hot enough spark. For starting service the principal progress has been in making batteries for extremely high discharge rates. The development of storage batteries for war purposes has been principally directed to the batteries used on the Liberty trucks and also on the Liberty aviation engines. The battery for truck service was tested on a vibrating platform and the battery was required to stand up on this shaking platform for at least a million bumps in a test of about thirty hours' duration. The aviation battery is a small storage battery used for the ignition of the new aviation engine. Necessarily, this battery had to be made non-spillable, so that during the various maneuvers of the aëroplane the electrolyte was not spilled from the battery.—*Transactions Cleveland Engineering Society*, September, 1918.

Telegraphy, Telephony and Signals

Telephone Exchange Transfers and Their Organization.—F. G. C. BALDWIN.—The subject is treated under the following subdivisions: Line plant considerations; methods of effecting transfers; preparatory work on line, at subscribers' stations, at old exchange and at new exchange; final preparations; the transfer operation; traffic and operating considerations; post-transfer work, and organization.—*Journal Institution of Electrical Engineers* (British), June, 1918.

On Valve Characteristic Curves.—The characteristic current-voltage curves for vacuum valves used in radiotelegraphy are taken up in this series. In the first article the effect of the voltage of the grid on the current-voltage characteristic is particularly dealt with. *Wireless World*, September, 1918.

Physics for Wireless Students.—This series of articles has for its aim the preparation of students of wireless in the necessary groundwork of physics. In the sixth number of the series the general subjects of energy, resistance, inertia and elasticity are dealt with. It is an attempt to show the analogy between mechanical and electrical systems.—*Wireless World*, September, 1918.

Propagation of Electric Currents in an Antenna.—H. CHIREIX.—The problem of the propagation of electric currents in an antenna has not usually been treated except in the case of homogeneous antennas and for the wave length corresponding to the resonance of the system. The author takes up the case of non-homogeneous antennas and develops extended formulas in the complex instance of three antennas having different characteristics. Finally, he attempts to establish formulas in cases where self-inductance and capacity per unit of length cannot be considered as constants but vary continually according to a law determined in advance.—*Revue Générale de l'Electricité*, Sept. 14, 1918.

Miscellaneous

Use of Hydrogen-Volatile-Matter Ratio in Obtaining Net Heating Value of American Coals.—A. C. FIELDNER and W. A. SELVIG.—It is pointed out in this article that net heating value is more important and thorough than total heat of combustion in consideration of different kinds of fuel. For instance, a comparison of coke and petroleum on the basis of total heats of consumption would be unfair to the coke, since practically all of its heat is available whereas 6.4 per cent of the total heat of petroleum remains in uncondensed water vapor. By the use of curves constructed from 2000 analyses the hydrogen content of bituminous coal, semi-bituminous coal and anthracite may be estimated from the volatile matter to within 0.6 per cent. For sub-bituminous coal and lignite the limits of deviation should be extended to 0.8 per cent, and if the coals are weathered the error may approach 1 per cent. The corresponding errors produced in the reduction of "total" to "net" heat of combustion are shown herewith, the values obtained being the errors in net heat of combustion due to the errors in computed hydrogen: For 0.6 per cent error in hydrogen, 56 B.t.u.; for 0.8 per cent error in hydrogen, 75 B.t.u., and for 1.0 per cent error, 94 B.t.u. In most coals the error in the net heat of combustion calculated in the above manner will not exceed 0.5 per cent, which is no larger than the errors incurred in sampling coal.—*Technical Paper No. 197*, Bureau of Mines.

Graphical Methods for Resistances in Parallel.—W. T. MACCALL.—The best known method for determining the combined or joint resistance of two resistors connected in parallel is shown in a simple diagram. Then follows the discussion of the case of three or more resistances in parallel which can be dealt with by successive applications of the method referred to. The joint resistance of two is obtained. This is then combined with the third resistance in the same manner, and so on.—London *Electrical Review*, Sept. 6, 1918.

Electrical Industry in Russia.—ALLAN MONKHOUSE.—In this article the writer shows what companies supply the heavy machinery, motors, etc., to the industries in Russia. The point is particularly to show what hold the German corporations had on this business at the beginning of the war and also to indicate the present status. The author also takes up the manufacture of cable, electrical instruments, telegraph and telephone instruments, insulating material, etc., with especial reference to foreign control of such manufacturing.—*Electrical Review*, Sept. 20, 1918.

Water-Power Legislation.—In this article is given a brief description of the laws governing the ownership of water-power sites for Italy, Austria and Switzerland.—*Electrical Industries*, Sept. 25, 1918.

NEWS OF THE INDUSTRY

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields

WAR INDUSTRIES BOARD MAY BE RECONSTRUCTION AGENCY

This Will Be a Probable Outcome if the Overman Bill Is Passed by Congress—Attitude of the Republicans

BY WINGROVE BATHON
Washington Representative "Electrical World"

In connection with the possibility of a reconstruction and readjustment agency being created by act of Congress, opinion is crystallizing in Washington along the line that the members of the War Industries Board will most likely be appointed to this work in case the Overman bill, which is an administration measure and which provides for a commission of five members to be appointed by the President, is passed by the present Congress. There is every expectation that this bill will be passed, and the likelihood of its passage has been added to by the defeat for reëlection to the Senate of Senator Weeks, who proposed a reconstruction measure which would have created a reconstruction agency composed of members of Congress.

President Wilson's Probable Course

In Washington it is now believed that if the Overman bill is passed President Wilson is likely to name as members of the reconstruction commission men like Bernard M. Baruch, chairman of the War Industries Board, and some of his principal associates. It is pointed out in Washington that while Senator Weeks has been defeated his idea of a legislative reconstruction agency has not necessarily died. In other words, it is expected that during the life of the present Congress Senator Weeks' idea will be pushed. But it is also pointed out in Washington that there is every likelihood that if a congressional reconstruction agency were created, even admitting that the consent of President Wilson to do so could be obtained, the new Congress which takes office March 4 next would likely legislate out of existence, possibly by failing to appropriate moneys, the creature of the present Democratic Congress. All the present signs in Washington, however, tend to show that the Overman bill will be passed and that the machinery of the War Industries Board will be turned into after-the-war work behind the commission to be appointed under the Overman bill, under the probable leadership of Mr. Baruch as chairman of the new commission.

It is pointed out in Washington that the present agencies of the War Industries Board are in possession of complete data and information concerning the industrial, commercial, financial and transportation resources of the country. For this reason there are many who believe that the War Industries Board is the only agency equipped with machinery and supplied with the necessary information to give suitable guidance to business for after-the-war work.

Effect of the Elections

There is no means of ascertaining or predicting what effect the elections of Nov. 5 will have upon business and the necessary reconstruction period to follow the war. It must be borne in mind that a great number of Republicans newly elected to the Senate and the House will not take office until March 4, 1919, when a new Congress will come into existence. There has been much newspaper comment to the effect that if the Republicans gained control of the House and the Senate there would in all likelihood be an extra session of the new Congress early next year at which members elected Nov. 5 would take their seats. The writer sees very little prospect of that, because it is extremely unlikely that a Democratic president would call an extra session of a Republican Congress together to deal with business matters such as will be involved in the reconstruction period, and it is almost certain that the present Democratic Congress, in view of the foreign situation, will hold on and remain at work in Washington until the very last minute before March 4.

Because of the prospect of peace, members of the War Industries Board, more particularly committees of that board, are announcing in Washington their intention of preparing to return home and get ready for the reconstruction period which they must face in their own businesses. In some respects this attitude, while natural, is greatly to be regretted, according to the best opinion obtainable in Washington, because of the growing belief that the War Industries Board, which has done so much to guide business during the war, is so well fitted to continue to guide business during the reconstruction period.

SAVING OF FUEL BY THE INDUSTRIAL PLANTS

Standard Recommendations of the United States Fuel Administration Lead to Large Economies in Coal Consbmption

Through the coöperation of the industrial power plants which have thus far put into fôrce the standard recommendations of the United States Fuel Administration to promote efficiency in the use of fuel in power plants, a saving of 7,000,000 tons annually has been effected. That is to say, in the first six months from the announcement of the national program 3,500,000 tons have been conserved, at the same time maintaining maximum production in the factories. The largest savings have been in Massachusetts, Pennsylvania, Connecticut, Illinois, New York, Missouri, Michigan, Minnesota and Wisconsin.

The Time Has Now Come to Give

That the light may shine afar off. This big sign is illuminated at night and throws its welcome message of good cheer far into the gloom.

CONSTITUTION AMENDED BY THE JOVIAN ORDER

Annual Convention in Dallas Places Entire Control in Hands of Elective Committee—L. O. Ripley, Wichita, Kansas, Elected Jupiter

Adoption of an amended constitution for the Jovian Order was the most important business before the order's sixteenth annual convention at Dallas, Tex., Oct. 24 and 25. About 150 delegates were in attendance.

The amended constitution carries forward the constitution as amended in 1916, with the amendments included that were adopted in 1917 and with further amendments creating what is termed Jupiter's cabinet. This cabinet is composed of six members elected from among the members of the order who are executives in corporations that have become, by reason of their own voluntary action, underwriting members of local Jovian leagues. This cabinet will fill the place of a financial committee, executive committee and board of directors combined. Three members will be elected each year, after the machinery is in motion, thereby leaving three hold-overs each year. The budget covering the expense of running the central office and other expenses properly pertaining to the order will be approved by the cabinet.

The amended constitution further provides for a different schedule of dues, permitting the younger members who draw smaller salaries to pay dues of $2 per year. It also provides that such members as are eligible to Jupiter's cabinet must pay $20 per year.

The following officers were elected for the ensuing year:

Jupiter—L. O. Ripley, Wichita, Kan.

Mercury—Ell C. Bennett, St. Louis, Mo.

Jupiter's Cabinet—H. J. Pettingill, St. Louis; W. B. Head, Dallas; Martin J. Insull, Chicago; Henry L. Doherty, New York; Henry Harris, Pittsburgh, and J. F. Porter, Kansas City, Mo.

Congress.—First district, Hartwell Jalonick, Neptune, Dallas, Tex.; second district, Charles B. Burley, Mars, Boston; third district, George W. Fells, Vulcan, New York; fourth district, H. E. Shelton, Pluto, Wilmington, Del.; fifth district, E. B. Zimmerman, Triton, Cleveland; sixth district, T. W. Moore, Avrenim, Atlanta; seventh district, Guy E. Seyler, Apollo, Richmond, Va.; eighth district, Galen Crow, Hercules, Guthrie, Okla.; ninth district, Fred Johnson, Ajax, St. Louis; tenth district, Carl Goland, Argus, Milwaukee; eleventh district, William T. Wallace, Amphion, Boise, Idaho; twelfth district, T. B. Burneigh, Atlas, Denver, Col.; thirteenth district, J. N. Colkitt, Comus, Los Angeles; fourteenth district, George C. Ruff, Chiron, St. Catharines, Canada; fifteenth district, H. W. Billings, Cadmus, Winnipeg, Canada.

In selecting Mr. Ripley as Jupiter the delegates felt that the office was being given to a man who had shown deep interest in Jovianism and who resided in a section of the country where the keenest interest in the order centered. Mr. Ripley has been unusually active in Jovian work ever since he went to Kansas in 1909. He has occupied various offices in the order, including the position of Ajax in the sixteenth congress. He has an unusually large circle of acquaintances in the Southwest. Mr. Ripley was graduated from Union College, Schenectady, N. Y., in 1900. He spent the next three years doing construction and storage-battery work throughout the East. In 1903 he was employed as superintendent of light and power by the Schenectady Railway Company. In 1906, when the illuminating and railway company were separated, Mr. Ripley became general manager of the illuminating company, which position he held until 1909, when he removed to Wichita, Kan., to become general manager of the Kansas Gas & Electric Company. He was soon ofterward made vice-president of that concern, which position he still holds. Mr. Ripley is an active member of the National Electric Light Association.

JUPITER-ELECT RIPLEY

OUTLOOK FOR FOREIGN TRADE AFTER THE WAR

E. M. Herr, M. A. Oudin and W. W. Nichols Speak Before American Manufacturers' Export Association on the New Problems

Several addresses presenting the viewpoint of electrical manufacturers were made before the convention of the American Manufacturers' Export Association at the Hotel Waldorf-Astoria, New York, on Oct. 30 and 31.

E. M. Herr on Ships After the War

E. M. Herr, president Westinghouse Electric & Manufacturing Company, made an address on "Our Ships After the War. The Manufacturer's Viewpoint."

Having an adequate fleet under our flag and laying aside for the moment the fact that this fleet is owned by the government, Mr. Herr asked, what other things are essential to the full development of our foreign trade?

First—This great fleet must be adequately manned. During the war these vessels will be entirely used by the United States government and therefore will form a part of the United States Navy and Army transport service. As such they will be manned by our young enlisted men who will thus be trained as sailors in much greater numbers than would otherwise be possible, and while many will return to other vocations at the termination of the war, a large number will still be available for the manning of these ships in export trade. Many of the sailors of other nations whose marine trade has to a greater or less extent been injured by the ravages of the great war will also be available, so that it would seem reasonable to expect no very great difficulty in manning our new merchant fleet.

Second—Will money be available adequately to finance this expansion of overseas transportation on which we are now embarking? There is no doubt that the ending of the war will not only leave the United States the greatest creditor nation on earth but also the nation with the greatest command of financial resources. It should, therefore, be entirely possible, and perhaps comparatively easy, to arrange the financial resources necessary for the conduct of this great business.

As government ownership of transportation facilities has never brought cheap rates and efficient service and in Mr. Herr's judgment never will—especially under a republican form of government, or in fact any form of government now to be considered, the speaker took up the question of the need of modifying present shipping laws to assure successful results under private ownership.

"This means the repeal of the LaFollette seaman's act and the enactment of such new legislation as the necessities of our competition may require," he said. "Let us endeavor to shape this legislation so that while fair, even liberal, to American labor, it will place no embargo on the employment of such foreign labor as may be necessary on our ships to enable them to be successfully operated.

"Let us remember that perhaps the greater problem in economics is distribution. Our ships, docks and the terminal facilities of our railroads are among the most important factors in this great problem of distribution. These must be coördinated and developed in the American way. We have all the problems in connection with labor, industry and finance which other nations have, but none of these problems is more serious for us than for others, while in many respects we are much more favored than any nation. If we pursue our course in the true American way, utilizing to the limit our demonstrated ability in organization and the scientific development of improved efficiency, we can confidently look forward to an area of progress and development in the United States such as the world has never seen."

Mr. Oudin on Foreign Trade Service

"If we are to maintain our present economic position, an export trade is indispensable," said M. A. Oudin, foreign manager General Electric Company, in his address on "Foreign Trade Service in the Present Emergency; An Essential Service."

Mr. Oudin's paper pointed out "that service abroad in the interest of American commerce is essential to our national prosperity and security; that it combines patriotism with the spirit of adventure, and finally that such service is surpassed in usefulness and dignity by no other service, to which the very best type of our citizens can devote themselves, and in consequence educational preparation for it is fundamental."

After discussing the necessity of training men to be business diplomats in the widest sense, as well as salesmen, Mr. Oudn discussed international conditions, saying in part:

"With the return of peace, we shall cease to be only merchandisers in the foreign trade. We shall be investors in foreign enterprises and purchasers of the obligations of foreign countries, thereby becoming associated as partners with the business men of other countries. When post-war experience has shown, as it will, that the high cost of production in America has put us at a serious disadvantage in a free market, we shall realize the chief benefit of foreign investments.

"Our commerce will continue to meet with unprecedented competition, but economically we shall probably attempt a harmony of effort with all the countries, large and small. If we are to attempt a league of nations, unless there be an economic understanding of equal extent and effect, one may well inquire as to the advantage of such a political arrangement. I do not believe that the smaller nations, which are numerically greater than the others, will be satisfied to surrender any of their present measure of political liberty unless the legitimate development of their economic life be guaranteed.

"An international millennium will by no means immediately follow upon peace. Yet we may in a way visualize the future. There will be a Europe with its three hundred millions of people, reasonably assured for many years of the free development of their national life. We see a Latin-America progressing under the stimulus of an ever-widening trade and the coöperative development of its natural resources. With increasing material prosperity and political importance and as members of some kind of an international association, their need and our need of a Monroe Doctrine grows distinctly less, if indeed that political policy does not tend to become obsolete. We see English colonies united more firmly than ever to the home country by a spiritual solidarity,

even extending to India, which, paradoxical as it may seem, becomes with a larger measure of self-government a closer member of the democratic and greater British union. We see a united China, free from the bugaboo of spheres of influence and the incubus of bad treaties forced upon her and of debts against which her resources have been pledged, a powerful and therefore self-respecting China, leaning and relying upon the friendship of her great sister republic and no longer subject to the 'purpose and interest' of other nations.

"In this new world after the war coöperative international relations will take on increasing importance, while exclusive economic policies will become unpopular. World politics by which the stronger nations profit will play a part of gradually decreasing importance."

W. W. NICHOLS ON EDUCATION AND INTERNATIONAL GOOD WILL

W. W. Nichols of the Allis-Chalmers Manufacturing Company, who presided as chairman of the "Education for Foreign Trade Service" session, called attention to the importance of education of two kinds: "The education of public opinion comes first and foremost," he said, "because public opinion will shape all federal legislation to make or break our enterprise; and second, the peculiar education of the individual whose life work will be foreign trade."

Mr. Nichols, speaking of the need of the world for international good will, said in part:

"While we are contributing freely of the prime resources of our national strength,—the lives of our strongest and the great wealth of our nation—for the complete victory of right over might, a peace assured by good will and the right to live our own best lives, at the same time we solemnly prophesy with the coming of this glorious peace the beginning of a commercial rivalry beyond precedent, a fierce competition the mere contemplation of which makes us miserable because it stirs in us the same base desire for conquest found in the German Kultur we condemn so unequivocally.

"I submit that, if we support the trend of present events, we can not admit for a single minute the glaring inconsistency embodied in the ever recurring phrase 'trade war after this war.'

"Look at it! We are fighting strenuously to save a political democracy in order that, when established in connection with a league of nations it will forever prevent a recurrence of the war now raging. By the same token why can we not recognize in commerce a similar democracy to the same effect? Democracy in commerce would prompt us to recognize the rights of our foreign competitors and to seek the welfare of those with whom we trade in order that we may continue to share in a welfare to which we contribute; mutual good will inevitably follows and where good will exists war is impossible. It prescribes the continual exercise of what has been called the Golden Rule of business.

"I would not ignore the many foreign trade measures already in the making in Europe. I would meet organization there by organization here, and hope for the same governmental support. We must act and act soon or our position in foreign trade will suffer great handicaps and possible irreparable injury. We must and should meet foreign competition—for truly here also competition is the life of trade—but it should be the right kind of competition to set an example to the rest of the world—constructive, not the destructive variety too long prevalent with us to the amazement and probable amusement of foreign business opinion.

"Under present circumstances the United States takes a foremost place and therein assumes an enormous responsibility in shaping coming events. Its leading position as a creditor nation of well-nigh unlimited resources, of genius, of enterprise and of an indefatigable ability in filling the position given us in a happy alliance which stirs our best emotions, can continue after this war if we accept the leadership in readjustment which will logically fall to us. In other words, we shall furnish the example in the prosecution of international trade. Let us rise to the occasion, meet bravely the heavy responsibilities which will be ours in spite of all we can do, instead of fighting for the false German monopoly, become an active factor in establishing an international good will that shall include all who do not deliberately forfeit their right to it."

W. S. GIFFORD RESIGNS FROM NATIONAL DEFENSE COUNCIL

Director of the Government Organization Retires and Is Appointed Comptroller of the American Telephone & Telegraph Company

Walter S. Gifford, until recently director of the Council of National Defense, has been appointed comptroller of the American Telephone & Telegraph Company and has entered upon his new duties. Mr. Gifford was formerly chief statistician of the American Telephone & Telegraph Company and was loaned by that company at the request of Secretary of War Baker to assist in the organization of the Council of National Defense Previously he was supervising director of the committee on industrial preparedness of the Naval Consulting Board.

In accepting Mr. Gifford's resignation as director of the Council, Secretary Baker wrote as follows:

The Council of National Defense has charged me with the expression of its deep appreciation of the services which you have rendered as director and to express its regret at your separation from the public service and from the work of the council. Your letter submitting your resignation very generously leaves the council to determine whether the exigencies of the public business justify its acceptance. We have therefore weighed the matter and feel that we would not be justified in asking Mr. Vail and the telephone company further to extend your leave of absence in view of the circumstances recited by your letter, and also in view of the fact that much of the constructive work which the council was called upon to undertake in the preparation of the country for war activities has now been performed and committed to regularly organized parts of established agencies of the government for future performance. We therefore reluctantly accept the resignation.

The termination of your activity as director of the council gives me an opportunity to express the grateful appreciation of the council for the energy, loyalty and success with which you have acted as the executive officer since the formation of the council. The work intrusted to us and to you was difficult, urgent and of great importance; to its successful performance you have contributed at every point, and it will always be a satisfaction to you to know that the members of the council feel that the conversion of America from a country at peace to a country prepared for war and waging war successfully was the work in which you had borne a helpful and considerable part.

PRIORITY RULES FOR POWER DISTRIBUTION

Regulations of Priorities Division of War Industries Board Governing Distributions of Electrical Energy by Preferential Classes

Rules and regulations governing the distribution of electric energy by light and power companies are contained in Circular No. 45 of the Priorities Division of the War Industries Board. The complete text of this circular, which was signed by Judge Edwin B. Parker, Priorities Commission, under date of Oct. 7, follows:

Under date of Sept. 3, 1918, there was published by the Priorities Division of the War Industries Board Circular No. 20, known as Preference List No. 2, which furnishes a guide to all governmental agencies and all others interested in (1) the production and supply of fuel and electric energy, (2) the supply of labor, and (3) the supply of transportation service by rail, water, pipe lines or otherwise, in so far as such service contributes to production of finished products.

Where the supply of electric energy is equal to the demand, there is obviously no occasion for use of the preference list; but where the demand exceeds the available supply, owing to lack of generating capacity or any other cause, then the producers and distributors of electric energy are directed to use the said preference list as a basis for distribution.

Whenever an individual plant has a preference classification differing from that of the industry to which it belongs, the individual plant classification shall govern.

Consumers having 100 hp. connected load or less will, save in extreme cases, be treated as in Class I, irrespective of their preference list classification. It has been determined that, speaking generally, the saving of electric energy through a curtailment of these small consumers would not justify the loss, damage, inconvenience and industrial disturbance that would follow. Where, however, it becomes absolutely necessary to do so in order to supply important Class I plants, even such small consumers should be curtailed.

Industries and plants grouped under Class I are only such as are of exceptional importance in connection with the prosecution of the war. Their requirements must be fully satisfied in preference to those of the three remaining classes.

The requirements of industries and plants grouped under Class II, Class III, and Class IV shall have precedence over those not appearing on the preference list.

If, however, after satisfying the requirements of Class I the requirements of the industries and plants grouped in the remaining three classes can not be fully satisfied, then they shall be rationed, giving to each class a per cent of its requirements in the ratio of 5, 3 and 2, which represents the relative value or importance of each class as fixed and determined by the Priorities Board.

A simple illustration of the application of this "method of weighted needs" as applied to the distribution of electric energy may tend to clarify this rule, under which there should be applied as nearly as practicable the formula following:

(a) The aggregate kilowatt demands of each of the four classes of all industries and plants shall be approximately ascertained.

(b) The available supply of electric energy shall be ascertained.

(c) Should the available supply equal the requirements or demands, then the requirements of all industries and plants on the Preference List shall be fully satisfied.

(d) But should the requirements or demands exceed the available supply of electric energy, then there shall be deducted from such supply the requirements of Class I, 100 per cent of which must be delivered, and the remainder shall be prorated between Classes II, III and IV, giving to each a per cent of its requirements in the ratio of 5, 3 and 2.

Assume that the available supply of electric energy in a particular city or district is 100,000 kw. while the requirements are as follows:

	Kw.
Class I requirements (including customers having 100 hp. connected load or less)	20,000
Class II requirements	40,000
Class III requirements	50,000
Class IV requirements	60,000
Total requirements	170,000
Available supply	100,000
Supply Class I in full	20,000
Balance for distribution between Classes II, III and IV	80,000

After having allotted Class I its full service, obtain the amounts of power to be served to the other classes as follows: Multiply the requirements of Classes II, III and IV by their priority ratio of 5, 3 and 2 respectively to obtain the "relative figures" as shown in the example following. The total available power for Classes II, III and IV (80,000 kw.) is then divided by the total of their "relative figures" (470,000 kw.), giving in the example a decimal of 0.17021. If the "relative figure" for any class is multiplied by this decimal, the result will be the power allotted to that class.

Class	Requirements, Kw.	Multiplied by Priority Ratio	Equals Relative Figure	Multiplied by Decimal	Equals Power Alotted, Kw.	Proportion of Requirements Served	Ratio of Service, per Cent.
II.....	40,000	5	200,000	0.17021	34,042	85.10	5
III.....	50,000	3	150,000	0.17021	25,532	51.06	3
IV.....	60,000	2	120,000	0.17021	20,426	34.04	2
Total.....		...	470,000	.....	80,000	.....	...

Note—80,000 ÷ 470,000 ÷ 0.17021.

Under this formula it will be seen that the power allotted to each of Classes II, III and IV will always fill a proportion of the demands of the classes in the ratio of 5, 3 and 2.

It will, however, sometimes happen when Class 2 or 3, or both, have extremely small requirements in proportion to the total requirements of the district, that the formula will allot to one or both of these classes an amount in excess of their respective requirements. In such a case the over-allotted class or classes should be given 100 per cent of their requirements and the balance of their allotment under the formula should be distributed either:

(a) Between the classes given incomplete service by the formula, in the ratio of their respective priority ratios (5, 3 or 2). This procedure is to apply where two classes are left incompletely served; or

(b) If only one class is left incompletely served by the formula, the over-allotments of the other two classes are to be assigned to the incompletely served class.

The allotment of more than 100 per cent under the formula to a small class of high importance shows that the shortage in the district was primarily caused by the large amount of less important work in the district and that the small class or classes of higher importance should not be penalized, since they are not responsible for the shortage.

It is not practicable, and it is not intended, that an attempt should be made to apply this formula with literal and mathematical accuracy, but it will afford a workable basis for rationing industries and plants embraced within Classes II, III and IV, where the available supply after satisfying Class I is less than their aggregate requirements or demands.

In case any consumer shall be dissatisfied with the applications made and the electric energy furnished him under these rules and regulations, such consumer may present his complaint in writing to the Priorities Division of the War Industries Board, sending a copy of such complaint to the power company interested. Pending further directions from such Priorities Division the power company shall continue to distribute electric energy in accordance with these rules and regulations notwithstanding the lodging of a complaint by a dissatisfied consumer.

The War Industries Board fully appreciates and is grateful for the support and whole-hearted coöperation which it has received at the hands of both the producers and distributers of electric energy on the one part and their consumers on the other in connection with the handling of such cases of power shortages as have already arisen. These rules and regulations have been promulgated with the view of stimulating production to meet the requirements of the war program and at the same time reduce to a minimum the inevitable disturbance to industry due to power shortages. With confidence we bespeak the continued coöperation of all interested parties in our efforts to reach sound and just solutions of these difficult and constantly recurring problems.

Committee on Development Proposed for the American Institute of Electrical Engineers

At a recent meeting the board of directors of the American Institute of Electrical Engineers passed a resolution providing that a committee on development shall be appointed by the president "to consider suggested or proposed modifications in the field and methods of work of the Institute and to make recommendations to the board of directors concerning these matters."

This committee will be similar in scope and plan of work to like committees, of the American Society of Civil Engineers, the American Society of Mechanical Engineers and the American Institute of Mechanical Engineers. It will take up matters that it deems advisable affecting the activities of the Institute.

WAR CONSERVATION IN ELECTRICAL SUPPLIES

Delay in the War Industries Board Announcements Is Due to the Desire to Receive Criticisms of Tentative Schedules

The delay on the part of the War Industries Board in making public the expected announcements in regard to conservation in electrical equipment, including heating devices, panelboards, reflectors and supplies, is understood in Washington to be due to the fact that the board wishes to give time for complaints to come in based on the tentative announcements which have been and are being placed in the hands of dealers, manufacturers, etc.

The Washington correspondent of ELECTRICAL WORLD has been informed by the board that the delay in making public the announcement concerning electrical heating devices is due to the fact that Chairman Stearn's committee has made a complaint in regard to that tentative schedule and that some readjustment is being asked before the formal announcement is signed and published. It is stated in Washington that a period of two weeks has been set by members of the board for complaints to come in in regard to the various items of manufacture and supplies mentioned, and that if at the end of two weeks no complaints of consequence have been received it will be fair for the government to assume that the tentative schedules will work out well in practice.

The feeling prevalent in Washington is that a large number of manufacturers of electrical devices are turning out a greater variety of these than war conditions warrant. Moreover, it is felt that a considerable curtailment could be effected without material injury to the branches of manufacture involved. This means that not only will material and equipment be conserved, but the stocks of manufacturers and jobbers, together with the investments which these entail, would be considerably reduced, and a fair amount of iron and steel, so urgently needed by the government for purely war purposes, released.

For instance, in the manufacture of lighting fixtures for industrial and public uses, some manufacturers have agreed with the government that the number and styles of angle reflectors and flat-cone reflectors could be reduced to one style for a particular angle to hold a certain limited range of lamp sizes. This is also true of deep cone and flat reflectors, as well as dome types for interior lighting and deep bowls or extensive-type reflectors. These are for the most part made of tin or steel, porcelain-enameled or painted. Thus it is felt that with angle reflectors, for instance, five types would take care of all angles of from 30 deg. to 90 deg. and of all sizes of lamps from 15 watts to 1000 watts, both in painted-enamel and porcelain-enamel finishes.

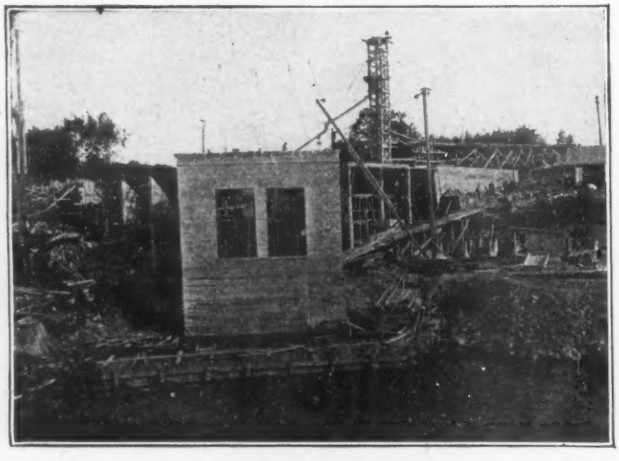
The same general reductions, it is pointed out, might be carried out without serious inconvenience in the other lines.

In the case of panelboards and cabinets conferences between the manufacturers and the War Industries Board have developed that panelboards with main switches without fuse connections, with main fuses only, and with through feeders with no fuses, might be

eliminated. It would also suffice if only one type of branch panelboard with plug fuses in the branches, one type of branch panelboards with night switches and fuses in the branches and two types of safety branch panelboards were hereafter manufactured. No hardship would be entailed if all single-branch panelboards were eliminated.

A rather complete survey has also indicated possible savings in the manufacture of cabinets. All styles of steel boxes, except the side-wiring gutter type, could be eliminated. Standardization on the thickness of the steel for the cabinets and fronts would not only save material but simplify manufacturing operations, and all special hardware, especially that requiring brass or bronze, could be dispensed with to advantage. Slate for bases need not be over 1 in. (2.5 cm.) thick, and there could be severe restrictions on the finishes on the current-carrying parts of panelboards. The manufacturers of switch parts have already made a considerable reduction in the number of finishes of switch plates, etc., so that the above curtailment in panelboard finishes is in line with the general policy of the War Industries Board to effect the greatest possible conservation in the use of materials in the interest of the war program.

Maine Hydroelectric Station Nearing Completion



The Rice Rips hydroelectric station of Central Maine Power Company is rapidly approaching the point of installation of generating equipment. It is planned to have this plant in operation during the winter peak. It will add 2700 hp. to the energy available for handling the important war industry loads on the Central Maine system, notably in the Bath district. The population of Bath has increased so fast on account of the shipbuilding development that additional electric service has constantly been required. Approval of the government was promptly given to the issue of securities by the Central Maine company for the construction of this plant and the necessary line and substation equipment. At Rice Rips the Messalonskee Stream will be utilized a third time for electrical energy generation by the company within a distance of about 10 miles. The company controls the outlets of the Belgrade Lakes, which contain about 30 square miles of storage area and discharges into the Messalonskee Stream, so that the water is used to the utmost advantages. Ninety-seven per cent of the 45,070,042 kw.-hr. generated in 1917 by the company was produced by hydroelectric stations.

IMPROVING CONDITIONS OF INDUSTRIAL-LIGHTING

Instructional Session for Special Guidance of State Factory Inspectors Held in Boston—Program of the Meeting

Through the courtesy of the Edison Electric Illuminating Company of Boston and under the auspices of the divisional committee on lighting of the Advisory Commission Council of National Defense, an instructional session was held at the Edison laboratory, Boston, on Oct. 31.

This session was for the special guidance of the factory inspectors of the Board of Labor and Industries in improving the conditions of industrial lighting throughout the state. It consisted of a series of somewhat informal talks by various specialists in lighting, together with laboratory demonstrations of practical lighting, its technique and measurement.

The program of brief lectures and demonstrations included:

"The General Principles of Artificial Lighting," by Dr. Louis Bell, consulting engineer Edison Electric Illuminating Company, past-president of the Illuminating Engineering Society.

"The Hygienic Aspect of Lighting," by Dr. F. H. Verhoeff, pathologist and ophthalmic surgeon, Massachusetts Eye and Ear Infirmary, assistant professor of ophthalmic research Harvard University.

"How Illumination Is Measured," by S. L. Keyes, photometrist of Edison Electric Illuminating Company, with demonstrations of practice in the laboratory.

Demonstrations of lighting intensities with relation to work.

"The Lighting of Textile Mills," by Prof. William L. Puffer, consulting engineer.

"Machine-Shop Lighting," by S. C. Rogers, General Electric Company.

"General Industrial Lighting," by H. W. Jordan, illuminating engineer, Edison Electric Illuminating Company.

Special effort was made to present these subjects in as simple and untechnical manner as possible with direct reference to the application of principles laid down to industrial lighting as it is found to-day under war conditions in the commonwealth.

Among those who attended the meeting were Edwin Mulready, Commissioner of Labor of Massachusetts, the deputy commissioner and about thirty inspectors and also a representative of the United States Department of Labor.

ONE should say a word for the Signal Corps, that all-essential arm of a modern army. Often before the Germans were cleared out of villages our signal men would have their telephone lines run. One youth told me that the line he put up was shot down twenty-four times. "What did you do?" I asked. He said: "I put it up the twenty-fifth time." I afterward learned that this boy guided a squad to a German machine gun in the nearby woods which had bothered his signal work. Because he led it there the wire stayed up after the twenty-fifth time.—*From a cable to the New York Times from Edwin L. James, "with the American Army in France."*

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities.

Increased Rates at Hoyleton, Ill.—A temporary order by the Illinois Public Utilities Commission permits the central-station company at Hoyleton, Ill., to increase its rates until Oct. 1, 1919, unless otherwise ordered. The commission allowed a depreciation of 4½ per cent on a $5,000 valuation. The rates for lighting range from 16 cents per kilowatt-hour to 11 cents per kilowatt-hour gross with a $1 net mimimum bill.

Granting Relief but Avoiding Revision of Schedules.—Deciding to approve increases in electric rates under certain conditions by the Aurora, Elgin & Chicago Railroad and subsidiaries, the Illinois Public Utilities Commission says in part: "An examination of the rate schedules filed by the company discloses that in general the increases requested for lighting and power service will amount to 25 per cent for all lighting service, including municipal street lighting, and 33⅓ per cent for all power service. In the schedules proposed by the company, several rates which have heretofore been in effect have been eliminated, and in some cases new rates are substituted of different character. It is probable that these changes would result in disproportionate increases of rates as applied to individual consumers. The commission has previously expressed itself to the effect that utilities applying for relief from present emergency conditions should not attempt materially to adjust and revise existing rate schedules unless complete justification therefor is submitted. It would therefore appear that the Aurora, Elgin & Chicago Railroad Company, pending further investigation, should keep in effect rates of the same character as the rates at present in effect and applicable to the same consumers and for the same character of service. The schedules as filed herein are unsatisfactory in form and do not comply with the general orders of the commission. The commission, having considered the rates herein proposed, all the testimony adduced and the representations and arguments made, and being fully advised in the premises, finds that the Aurora, Elgin & Chicago Railroad Company, the Ardmore Electric & Gas Company, the Elgin Merchants' Light Company and the DuPage County Electric Light & Power Company should be temporarily authorized to increase their rates for electric lighting service (but not for municipal street-lighting service) by an amount of 25 per cent of the net rates at present on file with the commission and should be temporarily authorized to increase their rates for all power service by the amount of 33⅓ per cent of the net rates as at present on file with the commission, subject to the conditions regarding refunds of advanced rates or such portions thereof as may be found to be unjust."

Extensions in War Time.—Some time ago the Eastern Wisconsin Electric Company, which operates the electrical railway utility at Sheboygan, Wis., the gas, electric and railway utilities at Fond du Lac and the railway at Oshkosh, formulated a rule whereby no extensions would be made in gas or electric mains or lines unless the prospective consumer would agree to deposit the approximate cost of the extension and accept reimbursement in the form of service, and extensions under this rule would be made only in case the acquisition of the new business would be considered desirable under ordinary conditions. This rule was made the subject of a complaint by Alexander Marcow of Fond du Lac, and after due hearing the Railroad Commission of Wisconsin has issued a decision. The decision says in part: "The prospective consumers of gas on Sibley Street have been offered service under the provisions of this rule, but have declined to make the required deposits. The question at issue is, therefore, whether the company's temporary rule is reasonable under present conditions. Agencies of the United States government have repeatedly requested all public utilities as well as other industries to defer until after the war all extensions or betterments unless an immediate war purpose is served thereby. This request was again made by the War Industries Board on Oct. 3, 1918, in a letter from the chairman of the Capital Issues Committee. From the facts presented at the hearing it would be impossible to demonstrate clearly that the proposed extension of gas mains is needed for war purposes. Full compliance with the recommendation of the War Industries Board would therefore have prompted the company to refuse to make the extension under any conditions. The company, however, inasmuch as it has the necessary material on hand, is willing to make the extension under the rule above stated. The commission feels that it should coöperate in every way with the government in curtailing the use of materials and labor for nonessential purposes during war time, and that it should not require utility extensions unless they are found to be vitally necessary even under war conditions. In the present case the prospective consumers have managed for some time to serve their necessities with other fuel than gas, and we feel that they should be willing to continue to do so until the emergency is past. However, no objection will be interposed if the company sees fit to extend the mains subject to compliance on the part of the consumers with the conditions of the rule above referred to."

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month.

Public Service Company of Northern Illinois Section.—The Public Service Company of Northern Illinois Section of the National Electric Light Association has elected S. B. Cushing chairman and N. Leonard secretary.

A. I. E. E., Cleveland Section.—Prof. C. A. Adams, president of the American Institute of Electrical Engineers and chairman of the welding committee of the United States Shipping Board, Emergency Fleet Corporation, will address the Cleveland Section of the American Institute of Electrical Engineers on "Recent Developments in Electric Welding as Applied to the Building of Ships." The meeting will be held at the Hotel Statler on Tuesday evening, Nov. 19.

American Electric Railway Association.—A conference of the American Electric Railway Association was held Nov. 1 in New York City. At the morning session there was an address by President John J. Stanley, a report of the Electric Railway War Board was read, and members present discussed the needs of the interurban electric railway. The afternoon session was devoted to the discussion of lightweight cars, the zone system, higher fare, subsidies and public ownership.

Chicago Society Meeting Dates.—Before Jan. 1, 1919, the Chicago sections of the American Institute of Electrical Engineers and the Illuminating Engineering Society and the electrical section of the Western Society of Engineers will hold a number of joint meetings. The first of these was to have been held Oct. 28, but was postponed because of the influenza epidemic. It is planned that the speaker for the first meeting, Prof. C. E. Clewell of the University of Pennsylvania, will deliver an address on or near Nov. 15, on the subject "Industrial Lighting and the War." On Nov. 25 two papers on fuel conservation will be presented. Harold Almert, Chicago, will speak on the work of the Illinois Fuel Administration, and Preston S. Millar, New York, on lighting curtailment. The meeting scheduled for late in December, probably Dec. 30, will be a joint luncheon meeting for the three engineering societies and the Electric Club-Jovian League. Comfort A. Adams, president of the American Institute of Electrical Engineers, will speak on "Electric Welding in Shipbuilding." The secretaries of the three engineering societies are A. F. Riggs for the A. I. E. E., A. O. Dicker for the I. E. S., and Edgar S. Nethercut for the Western Society of Engineers.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Use of Water Power in Spain.—United States Consul General Carl Bailey Hurst, Barcelona, writes that the laws in force in Spain for the use of public water power are the outgrowth of legislation of 1866 and 1879, enacted before the advent of the great hydroelectric enterprises. Rapid development has necessitated numerous additions to the laws, which by their diversity caused certain misinterpretations. Accordingly, by royal decree the dispositions relative to securing concessions for the use of water power and the classification of various bodies of water as public utilities, as well as adjacent land necessary for construction work, have been coördinated and published in the Spanish official organ, Gaceta de Madrid, of Sept. 12, 1918.

Increased Rates Needed in Toledo.—The Toledo (Ohio) Railways & Light Company has sent a communication to Mayor Cornell Schreiber calling his attention to the necessity of temporarily increasing the receipts from domestic consumers in order to meet the increasing expenses of the electric department. For this purpose a service change of 50 cents per month is suggested. At the same time rates to wholesale consumers will be increased, this being the second time the step has been taken. President Frank R. Coates' letter to the Mayor says: "We had hoped that conditions might return to normal without the necessity arising for increasing our domestic lighting rates, but the time has come, in spite of very considerable advances which we have made in our wholesale rates, when we are obliged to ask for further relief, and we can only see our way clear by requesting each individual customer to bear a small share of the increased burden. It is our intention at this time to increase also our rates for wholesale power service, but the sum total of all proposed increases will be only sufficient to cover the present increased cost of production. We have studied the matter carefully and believe that as a means of relief the desired end can best be attained by increasing the bill of each individual customer 50 cents per month in the form of a service charge. This will in no way change our present domestic lighting rate of 8 cents per kilowatt-hour with 1 cent discount, but will simply be an additional charge per customer per month. Because of the fact that the regulation of all municipal and decorative lighting is now controlled by the Fuel Administration, we deem it unfair at this time to ask for any increase along these lines."

Electric Taxicabs Successful in America.—A. Jackson Marshall, secretary Electric Vehicle Section, National Electric Light Association, says that the electric taxicab installations in several American cities continue, after prolonged and exacting tests, to give excellent service. Shortly prior to our entrance into the war plans were maturing rapidly for the inauguration of extensive electric taxicab service in New York, Philadelphia and other large cities, the initial installation in New York City to have consisted of 500 such cabs, which were to have been augmented to meet the anticipated demand. When financial conditions will permit, this development will be launched, Mr. Marshall says.

Heavy Increase in Operating Costs.—In announcing new rates, effective on Oct. 21, the Helena (Ark.) Gas & Electric Company writes to customers that a few years ago it sold electricity at 20 cents per kilowatt-hour. As soon as operating costs would permit, the price was voluntarily reduced to 16 cents per kilowatt-hour. Later, in February, 1917, the price was again voluntarily reduced to 13 cents in spite of increasing costs due to war conditions at that time. The company says: "In April of this year, after operating several months at a material loss, it was found necessary to increase slightly the prices of electricity and gas. The increases made effective at that time were less than the condition required, but it was hoped that by effecting economies in operation and by careful and painstaking business planning the company could for the duration of the war maintain the prices made effective May 1. However, because of continued advances in cost of operating, we regret to say that this has not been possible and that the time has come when it is imperative that we make a further slight advance in rates. The fact is that the company has been operated at a loss of nearly $500 a month for the past seven months. It is almost unnecessary for us to explain the reason for this. The increase in freight rates about July 1 alone means an added expense to this company of nearly $5,000 a year. The taxes of the company were increased nearly $5,000 this year over the year previous. Our labor has demanded and has received increases commensurate with the increased cost of living expenses. The cost of all materials entering into the operation of our plants has increased, in some cases as much as 300 per cent. We wish it to be understood that the increases are not permanent, but are necessary to tide us over the present temporary emergency, during which our operating expenses are substantially greater than our income. When the war is over and normal and natural economic reactions bring about a decrease in the cost of operating our plants, our consumers can expect, and will receive, a corresponding reduction in the cost of gas and electricity." The maximum lighting rate is now 17½ cents.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies.

Measure for Damages in Water-Power Diversion.—The difference in the value of the water power before and after the diversion of water is the correct rule of damages, the Supreme Court of New York has held (172 N. Y. S. 16).

Admissible Evidence in Action for Death.—In action for death of defendant's engineer from contact with charged chain hanging above a lamp-testing apparatus, wherein defendant offered evidence that it furnished rubber gloves, testimony of one who worked with deceased until eight months before accident that no gloves were then furnished was relevant, according to the Supreme Court of South Carolina in Eargle versus Sumter Lighting Company (96 S. E. 909). Opinions of expert electricians that place and appliances were reasonably safe were admissible. Evidence of repairs of alleged defects after the accident was inadmissible. In action for employee's death plaintiff may show subsequent alterations or repairs so far as necessary to show that defective conditions existed at the time of accident to aid jury in determining whether appliances were reasonably safe, but not to prove negligence as to conditions then existing.

Considerations in Rate Fixing.—The making of rates to be paid to a public utility is a legislative function to be exercised by the Legislature or subordinate body to which the power has been delegated, and where the steps prescribed by the Legislature have been followed an order of such body will not be reversed by the court unless it appears from the record of the proceedings that it is unreasonable or unlawful, the Supreme Court of Ohio held (120 N. E. 330). By the provisions of the general code, the Public Utilities Commission, in fixing reasonable rates to be charged by a public utility, is required to have due regard to the value of all the property of the utility used or useful for the convenience of the public, excluding therefrom the value of any franchise or right to own, operate or enjoy the same in excess of the amount actually paid to any political subdivision of the state or county as the consideration of such franchise or right, and exclusive of any value added thereto by reason of monopoly or merger, and of the necessity of making reservation out of the income for surplus, depreciation and contingencies, and of all such other matters as may be proper according to the facts as after due investigation they may be found to exist in each individual case.

R. W. Lamar, superintendent of electrical distribution with the Central Power Company, Canton, Ohio, has been commissioned a captain in the United States Engineers Corps.

J. W. Jones, general superintendent of the Central Power Company, Canton, Ohio, has resigned to become electrical and steam engineer for the United Alloy Steel Corporation.

Harry I. Blake of Pitcairn, Pa., formerly associated with the Cumberland Valley Railroad Company, has been named superintendent of the local power plant of the Pennsylvania Railroad Company.

George Leach, who was appointed superintendent of electrical distribution of the Central Power Company, Canton, Ohio, to succeed R. W. Lamar, who has been commissioned a captain, has also received the commission of captain in the United States Engineers Corps and has gone to Camp Humphreys, Va., for training.

F. V. Underwood, superintendent of the electric department of the Birmingham (Ala.) Railway, Light & Power Company, has resigned to take up work in the operating department of the Alabama Power Company. Mr. Underwood began work for the Birmingham company as troubleman, and he has held almost every position in the electric department.

Charles H. Forsgard has been appointed district manager of the Western Light & Power Company in its northern division, which includes the towns of Berthoud, Fort Collins, Greeley, Gilcrest, Loveland, Windsor, Wellington and adjacent territory, with headquarters at Fort Collins, Col. Mr. Forsgard is a graduate of the Agricultural & Mechanical College of Texas. He was manager of the Childress division of the Texas Gas & Electric Company. Previous to that he was connected with the Houston (Tex.) Lighting & Power Company.

Charles A. Semrad has been appointed general manager of the Western Light & Power Company, Boulder, Col. He had been acting general manager since April of this year. Mr. Semrad is a graduate of the University of Wisconsin and was connected with the Madison (Wis.) Gas & Electric Company and the Union Light & Power Company of St. Louis, Mo., before being connected with the Northern Colorado Power Company in 1909, the predecessor of the Western Light & Power Company. He was manager of the Cheyenne (Wyo.) Light, Fuel & Power Company, one of the subsidiaries of the Western Light & Power Company, until April of this year, when he was transferred to Boulder as acting general manager at the time H. U. Wallace resigned to take a commission as major in the army. Mr. Semrad is president of the Wyoming Central Station Association and a member of the Wyoming Legislature as representative from the city of Cheyenne. He is also active in civic, social and business affairs.

Men of the Industry

Changes in Personnel and Position—Biographical Notes

John H. Pardee, president of the J. G. White Management Corporation, New York, has been elected president of the American Electric Railway Association. Mr. Pardee was graduated from Hamilton College in 1889 and two years later was admitted to the New York bar and began practicing law in Buffalo. As a result of his successful reorganization of the Ontario Light & Traction Company and the Canandaigua (N. Y.) Light Company as attorney for the principal financial interests he was made general manager of the companies. It was in this administrative capacity that he entered the public utility industry. In 1902 he was appointed general manager of the Rochester & Eastern Railway, when he discontinued the practice of law to devote all of his time to utility management. It was in 1907 that Mr. Pardee joined the organization of the J. G. White Company, Inc., as operating manager of the company's utility properties. He was elected to the office he now holds of president of the J. G. White Management Corporation, then newly organized, in 1913. Mr. Pardee occupies the position of president or vice-president of a large number of utilities, among them being several electric light and power properties.

J. H. PARDEE

Prof. Thomas Witt Fitzgerald, who has been head of the department of electrical engineering at the University of Arizona for the last four years, has resigned to take charge of the department of maintenance and of electrical construction for the Ray Consolidated Copper Company at Hayden, Ariz. He also acts in a consulting capacity for these departments with the same company at Ray, Ariz.

Charles G. Du Bois has been elected a vice-president of the Western Electric Company, Inc. Mr. Du Bois entered the employ of the company in 1891 at its New York office and occupied successively the positions of chief clerk, secretary and supervisor of branch houses. In 1907 he became comptroller of the American Telephone & Telegraph Company and in this capacity inaugurated and supervised a comprehensive system of accounting for the Bell telephone system. During the winter of 1917-1918 he was in Washington in the capacity of comptroller of the American Red Cross, which position he still retains. Mr. Du Bois is forty-eight years of age and was graduated from Dartmouth College in 1891.

Obituary

William Mortimer Comstock, an inspector in the designing engineering department of the Edison Electric Illuminating Company of Brooklyn, N. Y., died at his home last week from pneumonia following influenza.

George M. Torzillo, general sales manager for the Sangamo Electric Company, Springfield, Ill., died Oct. 24. Mr. Torzillo had been in the employ of the Sangamo Company for more than five years. He was made sales manager in January, 1918.

Paul H. Cordes, first lieutenant of Company C, Thirteenth Engineers, was killed in action Sept. 12. Lieutenant Cordes was thirty-one years old. He had been in the employ of the Worthington Company twelve years, for the last five years holding the position of sales engineer in the Chicago office. His death will be regretted by his many friends and by his employers in civil life, who speak very highly of his loyal and efficient service.

Prof. Ichisuke Fujioka, president of the Tokyo (Japan) Electric Company and director of several other firms, died of apoplexy on March 5, 1918. Professor Fujioka was particularly well known in electrical circles in the United States. He was an honorary member of the National Electric Light Association and an associate member of the American Institute of Electrical Engineers. Besides, he was a fellow of the Royal Scottish Academy and a member of the British Institution of Electrical Engineers.

Howard H. Duff, assistant to vice-president, Lehigh Navigation Electric Company, Hauto, Pa., died on Oct. 24, a victim of the influenza epidemic. Mr. Duff was thirty-five years old. He was born in Jamaica and came to the United States to engage in power engineering. Prior to his connection with the Lehigh Navigation Electric Company he was with the Westinghouse company at Philadelphia. He then went to Allentown with the Lehigh Valley Transit Company, the main subsidiary of the Lehigh Navigation Electric Company. One of his most creditable accomplishments in the past year was the rehabilitation of the Front

TRADE & MARKET CONDITIONS

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies— Notes on Industrial Activities and Business Methods

SOME FACTORS THAT WILL IMPROVE JOBBERS' SERVICE

Existing Labor Conditions Force Supply Houses to Make a Stand with Regard to Returned Goods, Claims and Tracings

Great difficulties are being experienced by wholesalers in the matter of returned shipments, lost goods and customers' complaints about prolonged deliveries. Unusual conditions brought on by war are undoubtedly for the most part the cause. Yet in not a few instances the customer through carlessness brings about this confusion. It was so easy before the war to order anything and if it wasn't what was wanted to return it with a complaint and get satisfaction. It is always so in a buyers' market. In these times, however, care must be exercised in making out an order, and jobbers are now beginning to insist that it be done.

Where, however, goods must be returned or tracings made, or in event the goods are lost, the task involved must be made as easy as possible. Help is short. In this connection a prominent electrical jobber of the Northwest has formulated a set of rules which are now applied to these cases.

In order to return goods this house insists on the customer securing authority and sending notification. It has been found that considerable correspondence can be eliminated if it is known what material is being returned and why. In some instances the goods should be returned to the factory and not the jobber.

Claims for lost shipments and for damages in shipment, this house now insists, must be made by the customer. The jobber will help with all of the information possible but will not continue to enter and follow up claims.

In the matter of tracing shipments the house points out the difficulties in transportation and the federal regulation regarding L.C.L. shipments. Under these conditions the customer is told that it is useless to attempt to secure action on a tracer unless at least two weeks have elapsed since date of shipment.

GOODS IN FOREIGN TRADE MUST COMPLY WITH LOCAL REGULATIONS

Evidence of What Might Happen to Unapproved Electrical Equipment Furnished by the City of Winnipeg, Manitoba

In the program which electrical manufacturers will make for foreign trade after the war especial considcration must be given to local rules and regulations regarding electrical equipment. It will generally be folly to attempt to sell goods in a foreign market which do not fit local specifications. American manufacturers have been criticised quite severely in the past for apparently refusing to recognize peculiarities of foreign markets.

Evidence of the necessity for being careful in this connection was furnished at the recent convention of the International Association of Municipal Electricians, when F. A. Cambridge, city electrician of Winnipeg, Manitoba, told of the activities in Winnipeg in keeping unapproved electrical appliances out of the market. A law was passed in April, 1917, giving the city electrician the power of examination of devices and appliances. Since that time a considerable number of appliances have been examined, and the following have been condemned: Three lines of toy transformers (three different makes), two lines of bell-ringing transformers, three types of medium-base sockets, two types of warming pads, one type of water sterilizer, one type of grounding clamp, one type of electric kettle, one type of lamp dimmer, two types of cluster plugs, six types of electric heaters, and two miniature Christmas-tree lighting outfits.

In addition to these, a number of devices which have been offered for inspection have been withdrawn from sale by agents, pending alterations in design.

The author stated that most of the goods offered are of American manufacture and have never been submitted to the Underwriters' Laboratory. The natural course is to refer the maker to that organization, and the result has been that preliminary steps have been taken in some cases to obtain information as to procedure. It was pointed out that in the case of toy transformers there was not one make of this article on the approved list before the city took the drastic action above related. Now, it is said, one manufacturer has obtained approval of four types and as a result has secured Winnipeg's trade.

EASIER NOW TO REPLACE JOBBERS' STOCKS OF CONDUIT

Supplement to Priorities Circular No. 4 Gives A-6 Rating for Replacement of Iron and Steel Stocks for Orders Rated A or AA

Jobbers should be in a better position as regards stocks of iron and steel products, of which conduit in this connection is probably the most important, as a result of the rules and regulations contained in Supplement No. 2 to Priorities Circular No. 4, issued Oct. 15 and reviewed in the ELECTRICAL WORLD for Nov. 2.

According to Section 8 of the supplement, jobbers retain their rating of B-4 for maintenance of stocks of iron and steel products except where these stocks are used exclusively for purposes for which A-6 or higher classification has been provided or for use to complete orders covered by A-6 or higher priority certificates. In this case such jobbers' stocks may be maintained with an A-6 rating.

It is important to understand that the allowance of A-6 ratings is for iron and steel products of an unmanufactured nature. Thus, according to a strict reading of Subdivisions af and ag of Section 8 of Supplement No. 2, jobbers are not entitled to A-6 ratings on manufactured iron and steel products such as outlet and switch boxes, conduit fittings, pole-line hardware and other similar manufactured products.

Before a jobber may use the automatic ratings provided for in this supplement he must first have filed with the Priorities Committee and also with the director of steel supply his pledge. Also the jobber must require of the retailer or customer a pledge.

Each jobber shall, not later than the fifth of each month, file with the director of steel supply, on forms to be furnished by him, a certified statement covering shipments made by him during the preceding month. In this statement it will be necessary for the jobber to indicate the tonnage on which he is entitled to place the A-6 rating for replacement and the tonnage on which he is entitled to the B-4 rating for replacement. The jobber may report as orders covered by an A-6 or higher rating all orders re-

ceived directly from the War Department or the Navy Department of the United States, or the United States Shipping Board Emergency Fleet Corporation, or the Bureau of Industrial Housing and Transportation of the United States Department of Labor or the United States Housing Corporation, and also all orders received by him from his customers which bear the certification of an A rating.

The jobber may report as orders entitled to a B-4 rating for replacement all orders other than those covered by the A-6 replacement which were delivered for uses entitled to preference treatment as from time to time determined by the Priorities Division, or which orders were covered by permits from the Director of Steel Supply. The jobber shall likewise report the quantities ordered by him. Each jobber shall keep a file of the certifications on the basis of which he makes affidavit entitling him to A-6 rating on replacement tonnage. Any mill having any question as to the right of the jobber to ask for replacement on either the A-6 or B-4 basis should bring the matter immediately to the attention of the director of steel supply, War Industries Board.

To secure the ratings on the orders for replacement the jobber must accompany his order by the affidavit prescribed in Section 8, or by the affidavit and certifications prescribed in Section 9-B, both of Supplement No. 2, which may be obtained from the Priorities Division of the War Industries Board.

METAL MARKET CONDITIONS

Prices Show Effect of Armistice with Austria—Tin Regulation Announced

Evidence of the effect of the signing of the Austrian armistice is seen in the various markets for metals. Prices generally are breaking, and for the most part buying is listless. There are reports that copper, even, was sold down to 25½ cents last week. This was somewhat surprising in view of the fundamental condition of the copper-producing industry. The buyers of metals are somewhat disturbed over the part the government will play in the market after the war.

On Nov. 1 the War Industries Board announced the regulations under which importations of tin will hereafter be distributed. Arrangements are being made for licensing. No selling price has been announced, but probably one will be announced before the end of the year. A report to the board as of Oct. 1 indicates that there was a maximum stock of spot tin on hand in the United States at that date. Purchases for shipment here are progressing satisfactorily the Board announced.

NEW YORK METAL MARKET PRICES

	Oct. 29	Nov. 4
Copper:	£ s d	£ s d
London, standard spot	122 0 0	122 0 0
	Cents per Pound	Cents per Pound
Prime Lake	Govt. price 26.00	Govt. price 26.00
Electrolytic	Govt. price 26.00	Govt. price 26.00
Casting	Govt. price 26.00	Govt. price 26.00
Wire base	28.75	28.75
Lead, trust price	8.05	8.05
Antimony	12.75	10.50
Nickel, ingot	40.00	40.00
Sheet zinc, f.o.b. smelter	15.00	15.00
Spelter, spot	9.10	9.00
Tin, Chinese *	77.00 to 77.50	No quotations
Aluminum, 98 to 99 per cent	Govt. price 33.10	Govt. price 33.10

OLD METALS

	Cents per Pound	Cents per Pound
Heavy copper and wire	23.00 to 23.50	22.75 to 23.25
Brass, heavy	13.50 to 14.00	13.00 to 13.50
Brass, light	11.00 to 11.25	11.00 to 11.25
Lead, heavy	7.50 to 7.75	7.50 to 7.75
Zinc, old scrap	6.25 to 6.50	6.25 to 6.50

* No Straits offering.

THE WEEK
IN TRADE

BUSINESS generally is as good as ever and shows few signs of weakening on peace negotiations. The Pacific Coast reports a decline in the volume of business, but this is owing largely to the influenza epidemic. In the East this epidemic is pretty well played out, and in New York business went back to normal time on Wednesday.

Elections and electioneering played no part this year in business in spite of the great significance attached to this election.

New priority regulations announced last week are expected to help jobbers greatly in replacing stocks of steel goods sold on A priorities. The absence of such a ruling heretofore has placed the jobber in rather an unsatisfactory position when it came to serving the country at some future date.

NEW YORK

Little effect outside of the motor market is noticed as a result of the peace negotiations. In the motor market industrial plants engaged in war work seem somewhat disinclined to place orders at present. The government, however, has shown no tendency to let up on its purchases.

The situation on metal conduit and fittings appears to be clearing somewhat, and as a result of the latest supplement on priorities local stocks are expected to be placed in a better condition.

The building industries are making plans to start activities on a large scale as soon as it is possible to get materials, and after a meeting next week it is expected that an announcement will be forthcoming permitting a more liberal use of material in this connection.

BATTERIES.—Manufacturers have not yet been able to meet the demand for dry cells owing largely to the labor situation. There is a large domestic demand for standard batteries. Foreign demand for government use is principally for the flashlamp sizes. Local stocks are generally very low.

FLASHLAMPS.—Production is still below the demand, and local stocks are as a result very low. Deliveries in some cases are running a month and more. There is a large foreign business for government use. Domestic business is also large.

LAMPS.—Sales in this territory are running far in excess of last year. September sales through agencies were probably 30 per cent greater than in September, 1917. October sales, it is known, were large, but until agency reports are in (agents are allowed until the 10th to report) no definite figures will be available. General business also is large. It appears to be too early yet to notice any effect of the change back to the former daylight schedule. Stocks at present are in good shape, and any shortage that should arise here or there can be quickly taken care of.

MOTORS.—Peace talk appears to be retarding sales somewhat. One prominent distributer stated that up to three weeks ago he had been extremely busy on new work. Since that time, however, business has been dull. Last week it picked up somewhat. The falling off in business was noted to be for the most part from plants engaged principally in government work. The larger sizes have been affected most. Prices show no change, but an opinion was voiced that they might change shortly.

POLE-LINE MATERIAL.—The market locally shows no change. Business, which is largely of government nature, as far as could be learned, has not been affected by the recent peace talk. For some time government business has been lower than early in the year. This condi-

tion, however, was brought about largely by the policy of the government to place projects in the Middle West rather than in the industrial congested East.

CONDUIT.—Some material is beginning to come in for jobbers' stocks from manufacturers not loaded up with A orders. It is expected also that supplement No. 2 to Circular No. 4, just issued, will help stock considerably. Here jobbers are permitted to replace stocks sold on an A or AA rating by an A-6 priority. All told, the iron-conduit situation is looking better than it has for some time.

WIRE.—No change is reported in the wire market. Shipments for use by the Signal Corps in France are going ahead and domestic demand is the same. As soon as peace is declared a temporary lull is expected, but new building projects, it is believed, will then come into the market and more than absorb existing capacity.

CHICAGO

There have been no price changes during the week. The price situation is described as one in which "everybody is sitting tight." The peace talk has had no noticeable effect as yet on the jobbers' business, as far as can be seen. Some big extensions may have been delayed, but business of the week has been good. Firms which are working on government contracts have contiued to buy, and if there is any difference in the size of their orders it is of a somewhat trifling nature.

The most noticeable effect of the peace reports comes from the electrical manufacturing and allied fields. Here can be seen evidence in quantity of belief in early cessation of hostilities. It comes in the form of news of new products ready to announce. Moreover, the scope covered by this general movement is broad, the character of new products incuding lines that vary all the way from prime movers to sockets. Such a situation indicates that American manufacturers are thinking ahead.

The war order situation in the Chicago district continues to improve, the Middle West getting a better share of the contracts.

TIME SWITCHES.—While the domestic market is dull, a situation has developed in Australia which is helping manufacturers. Every one who wants electric service in a certain Australian city must put a time switch in his circuits in order to give the operating company a means of assuring itself that no energy will be taken on peak. American switches are being sold for this purpose.

SOCKETS.—Stocks of pull sockets are reported in some centers to be badly depleted. This will be helped to some extent locally by a new line being placed in the field. The new line offers a 600-watt, 250-volt pull socket which will be sold on a basis where quantity exercises a controlling power over the price.

INDUSTRIAL LIGHTING FIXTURES.—Demand for this type of fixture continues good with deliveries fair. Some manufacturers report that they have more business than they can take care of.

WASHING MACHINES.—The demand continues heavy. One washing-machine manufacturer who recently raised his price $15 is contemplating another increase of $10. In this field collections are slow. The labor situation where factories are located in the smaller towns is becoming more acute.

HIGH-VOLTAGE SPECIALTIES.—The demand from industrial plants on this equipment continues good, with deliveries about the same. Several manufacturers have noted a recent increase of business in this line from central stations.

ORNAMENTAL LIGHTING FIXTURES.—Most of the smaller manufacturers, taking care of local trade only, have taken on additional appliances for resale for the period of the war.

INDUSTRIAL CONTROL EQUIPMENT.—One manufacturer has stated that 55 per cent of his business is done direct with the government and the rest is indirectly government business.

BOSTON

The demand for electrical products continues heavy, and in some quarters inquiries and sales appear to be increasing somewhat. Many jobbers, however, are somewhat less rushed with new business than a few weeks ago. Activity averages well on the whole in industrial lines, and there are signs of increased interest in holiday products. Prices are about the same as last week, with no downward tendency as yet. Every one is talking about the possible end of the war in the near future, but very little let-up is permitted in the war service work of the industry by those who realize the importance of maintaining production at top speed until complete victory is established.

Stocks are running lower except in lines where there is very little demand. Deliveries are getting worse, and transportation conditions show little improvement, if any. Except in western Massachusetts and Connecticut, the retarding effect of the influenza epidemic is rapidly becoming a thing of the past. Collections have been hampered somewhat on this account, but are reasonably satisfactory at present.

The shortage of labor is little less than appalling, considering the demand. It is likely that the government authorities will soon be obliged to redistribute labor to some extent in New England in order to advance vitally necessary war work at the cost of less essential industries. A vigorous movement to deflect holiday trade to the present month so far as possible will shortly be under way.

ELECTRICAL SUPPLIES FOR AUTOMOBILES.—A fair business is being handled, but both supply and demand are tempered to the advancing season and difficulty of obtaining materials in the metal field.

INDUSTRIAL ELECTRICAL TRACTORS.—An order for forty tractors for the Boston army base has been placed with the Baker, Rausch & Lang Company, Cleveland. Exclusive of storage batteries, which are yet to be purchased, the order represents about $50,000. The order for 600 trailers for this installation has not yet been placed. Navy yard inquiries are a feature of the industrial truck market at present.

WIRE AND CABLE.—The demand still far exceeds the supply. Weatherproof wire is quoted on a 32-cent base and rubber-covered around 33 cents, subject to quantity advances and reductions. Stocks are low, especially in sizes of wire smaller than No. 8. One concern which received an order for 200,000 miles of twisted wire for field telephone service abroad has distributed the insulation work among others in order to multiply production. It is understood that other large wire demands are likely.

STORAGE BATTERIES.—Stocks are low, government business predominates, and within a few days it is expected that all the standard makes will have attained the 10 per cent average advance in price started last month.

REFLECTORS.—Stocks have been greatly reduced for three years, and the demand still keeps up. The municipal street-lighting market is virtually dead. Prices are about 20 to 25 per cent higher than a year ago. Recent business includes orders for ordnance base depots in France, units for military railroad construction by the use of special reflector cars, equipment for Y. M. C. A. cantonment huts (frequently 150 units per hut), and overseas orders from New Zealand, India, China and Australia. Substitutes for tin are urgently needed.

FARM-LIGHTING SETS.—The sale of these equipments has lagged somewhat in New England this summer, and while good progress has been made in preliminary canvassing, much remains to be done along the line of educating the rural market to appreciate the benefits of such apparatus. The outlook is good for next year's business.

MOTOR-DRIVEN SEWING MACHINES.—The demand is good. It is thought that the saving in material accomplished by some of the more compact outfits will be a factor in permitting normal production to be kept up for some time.

WASHING MACHINES AND VACUUM CLEANERS.—The demand for washers grows automatically and the supply is far below what could be handled if it were avail-

able. The business in cleaners is fairly brisk and stocks are meeting the situation reaonably well.

ELECTRIC RADIATORS.—The market has been virtually cleaned out of some of the more popular units, so far as the jobber goes. The retailers in many cases cannot supply specific products.

ATLANTA

The consensus of opinion from several sources throughout the Southeast would indicate that the volume of business in the electrical field has reached the crest. The pivotal point has been reached where ordinary commercial buying is suppressed to almost the minimum, and purchases for government account are now at what appears to be the maximum pitch.

The drought, which has broken, has been the most severe and protracted that there has been in thirty-five years. While it was universal in its nature, a large area of the Southeastern States was hit severely, including the following water-power territories: Atlanta, Macon, Columbus, Augusta, Ga., Alabama, Tennessee, North and South Carolina. The Mathis reservoir of the Georgia Railway & Power Company was practically empty on Oct. 21, and one week later, owing to heavy rains, water was flowing over the crest. The precipitation was so heavy in the Asheville (N. C.) territory that considerable damage was caused to several plants.

The American Fish Products Company, with the Ocean Leather Company, Fort Myers, Fla., contemplates the expenditure of $1,000,000 for dehydrating plants. The Valdosta (Ga.) Street Railway Company has applied to the Railroad Commission for an increase in street-car fare from 5 cents to 6 cents.

METERS.—Manufacturers report sales as moderate and considerably off as compared with the same period last year on residential types. Shipments are fairly prompt, and stocks are in good shape. There has been no price change recorded lately.

TRANSFORMERS.—The volume of business in the heavy-power type over 100 kva. has been slowly sagging off for the past six months, and sales are estimated as being 25 per cent behind last year. The demand for 2300-volt distributing types is holding up well, and on a comparative basis of one year ago there is no decrease in the volume of sales. Up to 50 kva. shipments are excellent, and Southeastern stocks are ample to take care of fall requirements.

WIRE.—Some sections report that rubber-covered wire is scarce. However, a few distributers have large stocks on hand. Weatherproof is fairly active and local stocks are complete, with the exception of No. 8, which is growing scarce, owing mostly to large drafts for government account coming sporadically.

STREET-LIGHTING EQUIPMENT.—There is little call for new equipment of this type from central stations, except for maintenance. Activity of an industrial nature exists, however, from government and indirect government plants. The sales of 100-cp. lamps are good. Shipments on fixtures show some improvement.

SEATTLE—PORTLAND

The volume of sales during the past week decreased materially as compared with the past several weeks. The influenza epidemic in the Northwest cities apparently is not lessening. Sales of retailers and small dealers for the past week show marked decrease with no improvement in sight. Jobbers' sales to shipyards and allied industrials show a slight decrease, but this is not blamed altogether upon influenza. Beginning Nov. 1, Seattle's wholesale and retail establishments were ordered closed prior to 10 a. m. and after 3 p. m. until the situation shall be well in hand.

The recent announcement of Chairman Hurley of the United States Shipping Board of plans to eliminate between fifteen and twenty wooden shipbuilding plants from the government program because of inefficiency is causing little concern in the Northwest, as yards in Seattle, Aberdeen and Portland districts are far ahead of schedule in both launching and deliveries. The supervisor of woodship construction in the Portland district reports that contracts for the 5000-ton Columbia River type vessel will be distributed shortly. The number of vessels has not been announced. Authorities state that the ending of war cannot affect the steel shipbuilding industry in the Northwest for at least two years, and the period of activity will probably continue for three or four years. In the Portland district the increase of building has been particularly noticeable during the past week. The Northwest Trust Company, Portland, has received permission to proceed with the erection of 100 homes in the peninsula district for war workers. These structures will range in price from $1,200 to $1,700. The Todd Dry Dock & Construction Company, Tacoma, will immediately erect seventy-five bungalows to cost between $2,000 and $4,000. Government agents in Oregon stated that, inasmuch as a survey has shown that the Northwest is amply provided with grain elevators, permits for the construction of additional elevators will be refused.

The labor situation is showing no signs of improvement. The shortage of labor in some steel yards is slowing up production in spite of overtime. Increased efforts to relieve the freight situation are resulting in slightly better Eastern freight deliveries. Oriental shipments are congesting local docks, and bottoms are not available.

SAN FRANCISCO

The electrical business from established sources continues below normal, but this is more than offset by special orders growing out of war conditions. Other Pacific Coast business, except for luxuries and semi-luxuries caused by unaccustomed high wages, continues below normal. The labor problem is again serious both as regards the supply and the wages paid. Efficient clerical and sales help is difficult to get. Shipyard wages have again been raised, the Pacific Coast receiving a 20 per cent advance as compared with a 15 per cent advance for the rest of the nation. The proposed shipping program has been curtailed, and it is reported that no contracts beyond 1919 construction will be placed. The influenza epidemic is now at its height along the Pacific Coast, but drastic measures are checking its spread.

Brisk showers fell during the week, and there is every promise of a welcome wet winter. A revised return on various crops shows that the increased acreage and increased production have offset the rain losses. The future of the grape crop is threatened by the fact that California will quite possibly go dry six months in advance of the United States. Other crops that have suffered are prunes, which are only 30 per cent of normal; nuts, including walnuts and almonds, which are 80 per cent of normal, and oranges, which are 60 per cent of normal. The last-named crop, by the way, is recovering, for 1917 was only 45 per cent of normal. These figures have a direct bearing upon the prosperity of their respective crop sections.

POLES.—With the exception of about 100 miles of tying-in lines, there has been small opportunity for the sale of poles. A few hundred have been sold for the new lines in the upper Sacramento valley, but although there are projects on paper there is no further actual construction in sight for many months. Besides lumber districts provide a competition that it is impossible to meet.

SCHEDULE MATERIAL.—Several large companies have built special departments to handle the extraordinary demand for marine schedule material. Coast jobbers find it good policy to offer a 10 per cent inducement for 1000-piece orders.

LAMPS.—Sales of carbon lamps have dropped off to a minimum because of the Fuel Administration's regulations. All frosted lamps are restricted. Standard lamps are seriously short because of the crippling of the Oakland lamp works through influenza.

Current Prices of Electrical Supplies

New York and Chicago Quotations

THE prices quoted are those prevailing in standard packages of specified lots on apparatus and appliances in Eastern and Middle West markets at the beginning of business on Monday of this week. They are in all cases the net prices or prices subject to discounts from standard lists of contractors, central stations, dealers and others engaged in the resale of such goods.

Prices in Southern and other nearby markets will rule about the same as those in the Middle West, although slight modifications to cover increased freight and local demands should be expected. In the Far West and on the Pacific Coast the prevailing prices are naturally higher, covering as they must increased freight and the necessity of larger stocks with increased interest and warehouse charges on account of the distances from sources of supply, infrequent turnover of stock and uncertainty as to delivery of goods in transit. Moreover, the Far West presents a wide variation in demand due to a small population spread over a wide area in agricultural and mining communities, as contrasted with the denser population of the East and Middle West, their nearness to the sources of supply, the more frequent turnover in stocks and the constant demands which arise in industrial centers. Price variations may be due to difference in grade of products of different manufacturers, to local conditions, or to both.

ARMORED CONDUCTOR, FLEXIBLE STEEL

Single-Conductor

B. & S. Size	List per 1000 Ft.
No. 14 solid	$61.00
No. 12 solid	71.00
No. 10 solid	90.00
No. 8 solid	106.00
No. 6 solid	145.00
No. 10 stranded	95.00
No. 8 stranded	115.00
No. 6 stranded	160.00
No. 4 stranded	205.00
No. 2 stranded	266.00
No. 1 stranded	315.00

Twin-Conductor

No. 14 solid	104.00
No. 12 solid	135.00
No. 10 solid	185.00
No. 8 stranded	235.00
No. 6 stranded	370.00
No. 4 stranded	575.00

NET PRICE AND DISCOUNT PER 1000 FT.—NEW YORK

Single-Conductor

	No. 14 Solid
Less than coil	List
Coil to 1000 ft	6%–10%
	No. 12 Solid
Less than coil	List
Coil to 1000 ft	6%–10%

Twin-Conductor

	No. 14 Solid
Less than coil	List
Coil to 1000 ft	6%–10%
	No. 12 Solid
Less than coil	List
Coil to 1000 ft	6%–10%

DISCOUNT—CHICAGO

Single-Conductor

	No. 14 Solid
Less than coil	+20% to $73.20
Coil to 1000 ft	List
	No. 12 Solid
Less than coil	+20% to $85.20
Coil to 1000 ft	List

Twin-Conductor

	No. 14 Solid
Less than coil	$115.00
Coil to 1000 ft	100.00
	No. 12 Solid
Less than coil	+20% to $162.00
Coil to 1000 ft	List

ATTACHMENT PLUGS

List ranges from $0.22 to $0.30 each.
Standard packages from 100 to 250.

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	+20%
1/5 to std. pkg	List
Std. pkg	15% to 17%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	+30% to 12%
1/5 to std. pkg	+5% to 20%
Std. pkg	18% to 44%

BATTERIES, DRY

NEW YORK

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.45—$0.46	$0.45—$0.47
12 to 50	.40	.40— .41
50 to barrel	.35— .36	.36— .37
Barrel lots	.32— .329	.33— .339

BATTERIES, DRY—Continued

CHICAGO

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.40 to $0.45	$0.40 to $0.45
12 to 50	.35 to .39	.35 to .39
50 to barrel	.319 to .362	.329 to .382
Barrel lots	.289 to .332	.299 to .342

CONDUIT, METALLIC FLEXIBLE

Size, In.	Ft. per Coil	List per 100 Ft.
⅜	250	$5.00
½	250	7.50
¾	100	10.00
	50	13.00
1	50	21.00
1¼	50	26.00
1½	25–50	35.00
2	25–50	45.00
2½	25–50	52.00

NET PER 1000 FT.—NEW YORK

	Less than Coil	Coil to 1000 Ft.
½-in. single strip	$75.00	$63.75— 69.75
½-in. double strip	75.00— 82.50	72.00— 75.00
¾-in. single strip	100.00	85.00— 93.00
¾-in. double strip	100.00—110.00	96.00—100.00

NET PER 1000 FT.—CHICAGO

	Less than Coil	Coil to 1000 Ft.
½-in. single strip	$75.00	$63.75 to $64.25
½-in. double strip	78.25 to $90.00	71.25 to 75.00
¾-in. single strip	100.00	75.00 to 85.00
¾-in. double strip	105.00 to 120.00	93.00 to 100.00

CONDUIT, NON-METALLIC FLEXIBLE

Size, In.	List per Foot	Size, In.	List per Foot
⅜	$0.05½	1	$0.25
½	.06	1¼	.33
¾	.09	1½	.40
	.12	1¾	.47
1¼	.15	2	.55
1½	.18	2½	.65

NET PER 1000 FT.—NEW YORK

	Less than $15 List	$15 to $60 List	$60 to $150 List
½-in.—	$25.00–51.70	$24.60–35.20	$23.00–30.25
¾-in.—	30.00–56.40	28.00–38.40	26.00–33.00

NET PER 1000 FT.—CHICAGO

	Less than $15 List	$15 to $60 List	$60 to $150 List
½-in.—	$44.00–60.00	$30.00–33.00	$26.50–29.15
¾-in.—	48.00–65.00	33.50–37.50	29.00–31.80

CONDUIT, COUPLINGS AND ELBOWS, RIGID IRON

Card No. 40

Size, In.	Conduit, List per Foot
⅜	$0.08½
½	.08½
¾	.08½
	.11½
1	.17
1¼	.23
1½	.27½
2	.37½
2½	.58½
3	.76½

CONDUIT, COUPLINGS AND ELBOWS, RIGID IRON—Continued

Size, In.	Couplings, List	Elbows, List
⅜	$0.05	$0.19
½	.06	.19
¾	.07	.19
	.10	.25
1	.13	.37
1¼	.17	.45
1½	.21	.50
2	.28	1.10
2½	.40	1.80
3	.60	4.80

DISCOUNT—NEW YORK

	⅜ in. to ½ in.	¾ in. to 3 in.
Less than 2500 lb	7% to 7.1%	9% to 9.1%
2500 to 5000 lb	10% to 10.1%	12% to 12.1%

(For galvanized deduct six points from above discounts.)

DISCOUNT—CHICAGO

	⅜ to ½ In.	¾ to 3 In.
Less than 2500 lb	+5.5% to 3.5%	+3.5% to +1.5%
2500 to 5000 lb	+2.5% to +0.5%	+5% to 1.5%

(For galvanized deduct six points from above discounts.)

FLATIRONS

NEW YORK

List price	$6.00 to $7.00
Discount	20% to 30%

CHICAGO

List price	$6.00 to $7.00
Discount	20% to 30%

FUSES, INCLOSED

250-Volt	Std. Pkg.	Lis
3-amp. to 30-amp	100	$0.25
35-amp. to 60-amp	100	.35
65-amp. to 100-amp	50	.90
110-amp. to 200-amp	25	2.00
225-amp. to 400-amp	25	3.60
450-amp. to 600-amp	10	5.50
600-Volt		
3-amp. to 30-amp	100	$0.40
35-amp. to 60-amp	100	.60
65-amp. to 100-amp	50	1.50
110-amp. to 200-amp	25	2.50
225-amp. to 400-amp	25	5.50
450-amp. to 600-amp	10	8.00

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	30%
1/5 to std. pkg	41% to 45%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	30% to 31%
1/5 to std. pkg	40% to 41%

FUSE PLUGS

3-Amp. to 30-Amp.

NEW YORK

	Per 100 Net
Less than 1/5 std. pkg	$6.00 to $9.37
1/5 to std. pkg	5.25 to 7.00

Standard packages, 500. List, each, $0.07

CHICAGO

	Per 100 Net
Less than 1/5 std. pkg	$8.00
1/5 to std. pkg	7.00

Standard packages, 500. List, each, $0.07

LAMPS, MAZDA OR TUNGSTEN

110 to 125 Volts

Regular, Clear:	Std. Pkg.	List, Each
10 to 40-watt—B	100	$0.35
60-watt—B	100	.40
100-watt—B	24	.85
75-watt—C	50	.70
100-watt—C	24	1.10
200-watt—C	24	2.20
300-watt—C	24	3.25
Round Bulbs, 3½-in., Frosted:		
15-watt—G 25	50	.60
25-watt—G 25	50	.60
40-watt—G 25	50	.60
Round Bulbs, 3½-in., Frosted:		
60-watt—G 30	24	.82
Round Bulbs, 4½-in., Frosted:		
100-watt—G 35	24	1.15

DISCOUNT—NEW YORK

Less than std. pkg	List
Std. pkg	10%

DISCOUNT—CHICAGO

Less than std. pkg	List
Std. pkg	10%

LAMP CORD

Cotton-Covered, Type C, No. 18

NEW YORK

	Per 1000 Ft. Net
Less than coil (250 ft.)	$30.47—$40.77
Coil to 1000 ft	27.42— 30.22

CHICAGO

	Per 1000 Ft. Net
Less than coil (250 ft.)	$38.00
Coil to 1000 ft	28.00

LAMP GUARDS, WIRE

Standard packages from 50 to 150

NEW YORK

Net per 100	$24.00

CHICAGO

Net per 100	$23.93 to $30.00

OUTLET BOXES

Nos.	List per 100
101—A, A 1½, 4 S.C., 6200, 320	$30.00
102—B.A., 6200, S.E., 300, A.X., 1½, 4 S.	30.00
103—C.A., 9, 4R, B 1½	25.00
106—F.A., 7, C.S., 1½, 3 R	20.00

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $10.00 list	26%	20%
$10.00 to $50.00 list	36%	31%

DISCOUNT—CHICAGO

	Black	Galvanized
Less than $10.00 list	20%	10%
$10.00 to $50.00 list	30%	20%

PIPE FITTINGS

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	10%
1/5 to std. pkg	20%
Std. pkg	30%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	5%
1/5 to std. pkg	15%
Std. pkg	25%

PORCELAIN CLEATS—UNGLAZED

Two and Three Wire

NEW YORK

	Per 1000 Net
Less than 1/5 std. pkg	$21.00 to $34.00
1/5 to std. pkg	17.85 to 28.90

Standard package, 2200. List per 1000, $21 to $34

CHICAGO

	Per 1000 Net
Less than 1/5 std. pkg	$16.80–24.15
1/5 to std. pkg	15.80–21.00

Standard package, 2200. List per 1000, $20.00–21.00

PORCELAIN KNOBS

NEW YORK

Per 1000 Net.	Std. Pkg. 3500 5½ N.C.—Solid Nail-it—N.C.	Std. Pkg. 4000 N.C.
Less than 1/5 std. pkg	$16.00 to $22.00	$32.00
1/5 to std. pkg	13.60 to 18.70	27.20

CHICAGO

Per 1000 Net.	Std. Pkg. 3500. 5½ N.C.—Solid Nail-it—N.C.	Std. Pkg. 4000 N.C.
Less than 1/5 std. pkg	$11.70–$18.40	$33.85–$36.80
1/5 to std. pkg	10.15– 16.00	26.60– 32.00

SOCKETS AND RECEPTACLES

	Std. Pkg.	List
½-in. cap key and push sockets	500	$0.33
½-in. cap keyless socket	500	.30
½-in. cap pull socket	250	.60

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	+20%
1/5 to std. pkg	List

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	List
1/5 std. pkg	10%

SWITCHES, KNIFE

250-Volt, Front Connections, No Fuse

High Grade:	
30-amp. S. P. S. T	$0.80
60-amp. S. P. S. T	1.20
100-amp. S. P. S. T	2.25
200-amp. S. P. S. T	3.48
300-amp. S. P. S. T	5.34
30-amp. D. P. S. T	1.20
60-amp. D. P. S. T	1.78
100-amp. D. P. S. T	3.38
200-amp. D. P. S. T	5.20
300-amp. D. P. S. T	8.00
30-amp. 3 P. S. T	1.80
60-amp. 3 P. S. T	2.68
100-amp. 3 P. S. T	5.08
200-amp. 3 P. S. T	7.80
300-amp. 3 P. S. T	12.00
Low Grade:	
30-amp. S. P. S. T	$0.42
60-amp. S. P. S. T	.74
100-amp. S. P. S. T	1.50
200-amp. S. P. S. T	2.70
30-amp. D. P. S. T	.68
60-amp. D. P. S. T	1.22
100-amp. D. P. S. T	2.50
200-amp. D. P. S. T	4.50
30-amp. 3 P. S. T	1.02
60-amp. 3 P. S. T	1.84
100-amp. 3 P. S. T	3.76
200-amp. 3 P. S. T	6.76

DISCOUNT—NEW YORK

	High Grade
Less than $10 list	+15% to +10%
$10 to $25 list	+10% to 2%
$25 to $50 list	2% to 5%
	Low Grade
Less than $10 list	+5% to list
$10 to $25 list	List to 8%
$25 to $50 list	15%

DISCOUNT—CHICAGO

	High Grade
Less than $10 list	+ 15%
$10 to $25 list	List to 2%
$25 to $50 list	5%
	Low Grade
Less than $10 list	+5%
$10 to $25 list	8%
$25 to $50 list	15% to 16%

SWITCHES, SNAP AND FLUSH

5-Amp. and 10-Amp., 125-Volt Snap Switches

	Std. Pkg.	List
5-amp. single-pole	250	$0.28
5-amp. single-pole, ind	250	.32
10-amp. single-pole	100	.48
10-amp. single-pole, ind	100	.54
5-amp. three-point	100	.54
10-amp. three-point	50	.76
10-amp., 250-volt, D. P	100	.66

10-Amp., 250-Volt Push-Button Switches

	Std. Pkg.	List
10-amp. single-pole	100	$0.45
10-amp. three-way	50	.70
10-amp. double-pole	50	.70

SWITCHES, SNAP AND FLUSH—Continued

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	+20%
1/5 to std. pkg	List
Std. pkg	15% to 17%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	+30% to 10%
1/5 to std. pkg	+5% to 16⅔%
Std. pkg	18% to 25%

SWITCH BOXES, SECTIONAL CONDUIT

Union and Similar—	List Each
No. 155	$0.34
No. 160	.60

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $2.00 list	Net to 30%	Net to 10%
$2.00 to $10.00 list	10% to 35%	5% to 40%
$10.00 to $50.00 list	20% to 37%	10% to 52%

DISCOUNT—CHICAGO

	Galvanized	Black
Less than $2.00 list	25% to 40%	20% to 30%
$2.00 to $10.00 list	25% to 50%	20% to 40%
$10.00 to $50.00 list	25% to 64%	20% to 50%

TOASTERS, UPRIGHT

NEW YORK

List price	$6.00 to 6.50
Discount	20% to 30%

CHICAGO

List price	$6.00 to $6.50
Discount	20% to 30%

WIRE ANNUNCIATOR

NEW YORK

	Per Lb. Net
No. 18, less than full spools	$0.54–$0.66
No. 18, full spools	.52– .56

CHICAGO

	Per Lb. Net
No. 18, less than full spools	$0.65 to $0.72
No. 18, full spools	.55 to .65

WIRE, RUBBER-COVERED, N. C.

Solid-Conductor, Single-Braid

NEW YORK

	Price per 1000 Ft. Net		
No.	Less than 500 Ft.	500 to 1000 Ft.	1000 to 5000 Ft.
14	$20.00–$25.00	$15.00–$17.00	$15.00–$15.75
12	23.58– 27.09	21.62– 29.09	17.68– 23.22
10	30.20– 37.80	27.45– 32.40	23.47– 32.40
8	42.74– 53.34	38.85– 45.72	33.21– 45.72
6	61.50– 84.42	55.35– 72.36	52.58– 55.48

CHICAGO

	Price per 1000 Ft. Net		
No.	Less than 500 Ft.	500 to 2500 Ft.	2500 to 5000 Ft.
14	$25.00	$18.00–$25.00	$15.50
12	$29.46– 31.44	29.46– 31.44	$25.54– 31.44
10	41.10– 43.84	41.10– 43.84	34.62– 38.36
8	57.00– 61.76	57.90– 61.76	50.18– 54.04
6	85.31– 97.68	85.31– 85.47	72.21– 85.47

WIRE, WEATHERPROOF

Solid-Conductor, Triple-Braid, Size 4/0 to 3 Inc.

NEW YORK

	Per 100 Lb. Net
Less than 25 lb	$39.75 to $44.00
25 to 50 lb	39.75 to 42.00
50 to 100 lb	38.75 to 40.00

CHICAGO

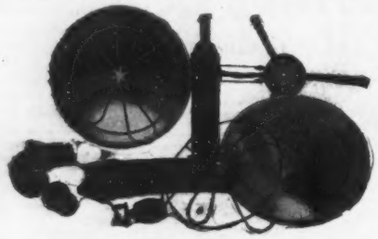
	Per 100 Lb. Net
Less than 25 lb	$41.00 to $41.76
25 to 50 lb	39.75 to 40.76
50 to 100 lb	38.75 to 39.76

NEW APPARATUS & APPLIANCES

A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

Twin Radiant Heater

Equipped with two heating elements and two reflectors, the twin radiant heater being manufactured by the American Electrical Heater Company, Detroit, Mich., is virtually two heaters in one. Being adjustable, these reflectors permit the heat to be thrown not



PARTS ARE REMOVABLE AND INTERCHANGEABLE

only in any desired direction but also in two different directions at the same time.

For insuring cleanliness and efficiency all parts of the heater, reflectors, heating elements and the protecting wire guards are removable and interchangeable without the use of tools. The heater is light in weight, has a handle and comes equipped with an 8-ft. (2.4-m.) cord, a detachable plug and lamp-socket attachment plug, making it available for use anywhere. The power required for each heating unit is 330 watts, making a total of 660 watts for the whole heater.

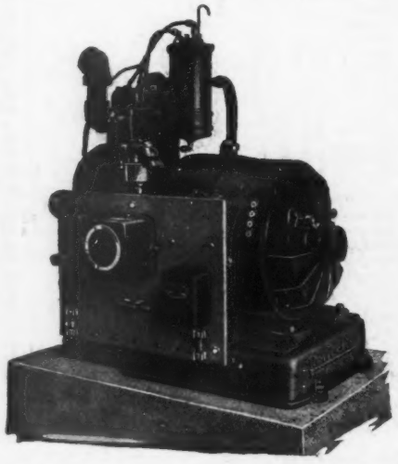
Electric Dishwasher of Family Size

A dishwasher to meet the requirements of an ordinary family is being manufactured by Redmon, Edgar & Redmon, Cedar Rapids, Iowa. It washes dishes by rotating them in a round metal open-work basket in a rectangular tank. The motion of the round basket in the square tank causes sufficient agitation of the water, it is claimed, to wash the dishes. The rotary motion is obtained through the use of a 1-6-hp. General Electric motor belted to the driven shaft. Each basket of dishes is rinsed by pure hot water after it is lifted above the level of the washing water. The rinsing water is supplied through spray pipes placed in the upper part of the tank in such a manner as to reach all parts of the dishes. The machine occupies a floor space of approximately 2 ft. by 2 ft. (61 cm. by 61 cm.) with the tables dropped, and 2 ft. by 5 ft. (61 cm. by 152 cm.) with the tables up. One basket for dishes and one for silverware are provided with each machine. To install the machine connections for gas, hot water and a sewer outlet must be available in addition to an outlet for electrical energy.

Low-Voltage Lighting Plants

Comprising an engine directly connected to a generator, a controlling switchboard and a set of storage batteries, automatic and semi-automatic farm-lighting plants are being made by the Perfection Storage Battery Company, Rhodes Avenue and Fortieth Street, Chicago.

The water-cooled engine develops 3 hp., is equipped with a carburetor for



SMALL, COMPACT AND SIMPLE TO OPERATE

either kerosene or gasoline burning and has a power pulley for running pumps, feed grinders, milking machines and other labor-lightening devices. Generators are of either 32-volt or 65-volt type, have a capacity of 1500 watts, or seventy-five 16-cp., 20-watt lamps, and utilize a fan on the engine flywheel for cooling and to prevent overheating.

Improper connection of the "Perfection" sealed-in glass-jar batteries is said to be obviated by safety straps.

The control panel contains a combined automatic cut-out start and stop switch, an ampere-hour meter, an auxiliary ignition switch, a battery-charging switch, light fuses and a bell signal of the semi-automatic style to indicate when the batteries need recharging. On the automatic-type plants the batteries are kept full without outside attention.

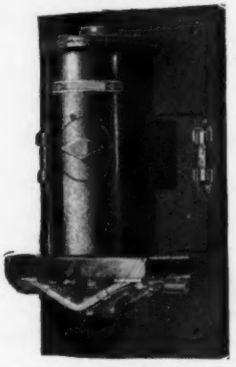
There are no exposed moving parts in the plants, yet inspection and adjustment are made possible by a removable cylinder head and inspection plate in the crank case. A self-contained oiling system is employed, thus eliminating grease or oil cups, while gages indicate the condition of both oil and fuel supplies, the latter being stored in the plant subbase.

Industrial Elevating Truck

Adapted to carry the platforms used by hand trucks, an elevating platform electric truck is being manufactured by the Buda Company, Railway Exchange, Chicago. Platforms for very short hauls may be carried by hand trucks while the electric may handle these platforms for longer hauls. The maker says this will greatly facilitate "process manufacture." The truck, which elevates a 4000 lb. load 3 in. (8 cm.) and steers on all four wheels, is equipped with Edison storage batteries and a Diehl motor with a Cutler-Hammer controller.

Remote-Control Switch

Automatic no-voltage-release equipment known as the "type A Diamond H" remote-control switch has been recently brought out by the Hart Manufacturing Company of Hartford, Conn. This outfit has been designed with a low-resistance closing coil and a high-resistance locking coil, the former operating only while the switch is closing and the latter being continuously in circuit when the switch is closed. If the control switch is opened or there is a failure in line voltage, an armature



MAY BE USED TO CONTROL SWITCHES WHERE HAND OPERATION IS DANGEROUS

suspended by the high-resistance coil falls, thus unlocking a main armature and allowing the switch to open by gravity. The manufacturer points out that this equipment is especially applicable for marine service, such as con-

trolling the externally visible lights of a ship from the bridge, a watertight "Diamond H" marine switch being provided for use of this kind.

Fittings for Lighting of Gages

For the lighting of gages for transformers, boilers, etc., the Appleton Electric Company of Chicago has designed the fitting shown herewith. This fitting is furnished complete with receptacle

HINGED DOOR ALLOWS EASY ACCESS TO LAMP

having a lamp grip, thereby insuring against the lamp falling out. The reflector is stamped from steel, rounded to give proper diffusion of light, and is fired with white enamel. It has a hinged door which can be securely fastened and permits of easy access when necessary to remove lamp for renewal or to clean the reflector. This fittting is to be known as the type "RGL Unilet."

Floodlight Projector

The Pittsburgh Reflector & Illuminating Company, 3117 Penn Avenue, Pittsburgh, Pa., has placed on the market a new reflector for type C lamps. The lamp in this unit is placed vertically so that the reflector partly surrounds the lamps and makes possible great efficiency in its use as a floodlight projector. The company claims that this reflector, not being a shallow reflector placed entirely back of the lamp but extending somewhat in front of the lamp, utilizes 75 per cent of the

REFLECTOR PARTIALLY SURROUNDS LAMP

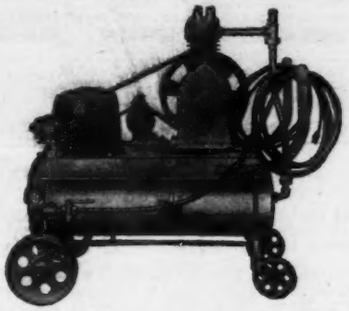
lamp's energy as against perhaps 35 per cent in the case of shallow reflectors.

In addition to a strong center beam of light, this unit gives a distribution covering 24 deg., making it extremely suitable for all kinds of floodlighting.

Economical Splash-Oiled Air Compressor

Especially adapted for inflating automobile tires, the Curtis Pneumatic Machinery Company of St. Louis is marketing a motor-driven air compressor which has the advantage of a storage tank in addition to that of portability. An especially well-designed splash self-oiling system is said by the manufacturers to be one of the distinctive features of the compressors. The regulated supply of oil is splashed into the cylinder as it is needed, resulting, it is stated, in the use of much less oil, in the need for very little attention and in the prevention of oil flooding the cylinder and thereby injuring tires and tubes by oil in the air supply. The flywheel of the compressor has fan-blade spokes and cools the cylinder when run in either direction—one way the air is blown against the cylinder and in the opposite direction the air is pulled past it.

The possibility of broken valves dropping and so injuring the machine is prevented by a safety cage, while a hand unloader permits starting the compressor against tank pressure with-



HAS STORAGE TANK AND MAY BE EASILY WHEELED AROUND

out burning out the motor or blowing the fuses. While the valves may be inspected without removing the head, still pipe connections need not be broken should it be desired to remove the head, since but one gasket is used.

The model illustrated is obtainable with either belt or gear drive, as is also a special model for use in limited space. A stationary outfit is also manufactured, and all three models may be had with five different sizes of compressors.

Portable Floodlighting Projector

A portable floodlighting unit, known as the "Litekraft" projector, has been placed on the market by C. W. Cole & Company, Los Angeles, Cal. Measuring 14 in. (35 cm.) in diameter, the reflector of the unit accommodates floodlighting or stereopticon lamps of from 220 watts to 500 watts rating. It is said to be correctly designed and built to throw a powerful light a considerable distance. The reflector is of highly polished silver plate and is inclosed for protective purposes in an outer shell, the entire unit being finished in baked enamel.

High-Voltage Switching and Protective Equipment

A feature of some 110,000-volt switching and protecting equipment recently made by the Electrical Engineers' Equipment Company of Chicago for Stone & Webster lies in the insulator units. These supports are made up of two standard 70,000-volt pin insulators stacked one on top of the other.

110,000-VOLT SWITCH IS 12 FT. HIGH

The insulators are held together by a rugged set of clamps. To the bottom clamp of each insulator a malleable pin is fastened, which is cemented into the pin hole. This type of construction makes a strong unit and is less expensive than a pillar-type insulator for the same voltage.

The switch parts proper were made with the double-blade type of construction, spring washers being used to secure proper contact. The switch is rated at 300 amp. When in use the unit is mounted in the position shown in the illustration with the blade vertical. It measures approximately 12 ft. (3.7 m.) from the lower end to the top of lock ring.

Washer with Copper Tub

An electric washer with a copper tub supported in a wooden frame is being manufactured by the Barlow & Seelig Manufacturing Company of Ripon, Wis. Among the features of the machine pointed out by the maker is the employment of a special ball-bearing 11-in. (27.5-cm.) roll wringer, which can be swung out of the way when not in use, and has an easy reversing mechanism as well as a release for use in case of accidents. Both chain and gears are quiet, the latter being partly inclosed for protective purposes, while a belt is used for connecting the motor and the washer mechanism. Special bracings are provided for the legs, and red cypress is employed wherever the wood frame comes in contact with water. Washing the clothes clean is said to be materially assisted by the dasher, which has four spouts.

Trade Notes

Changes in Northwestern Organization

The following changes are reported in the sales forces of the Northwestern Electric Equipment Company, St. Paul and Duluth, Minn., jobber:

A. M. BALDWIN, formerly manager of the Duluth house, has returned to the St. Paul office to the duties as manager of sales.

W. A. GRIMES has succeeded Mr. Baldwin and is now manager of the Duluth house.

B. C. HOLST, formerly covering the Iowa territory, has been called into the home office to take charge of the new specialty department recently created. This department covers the sales of heating material, washing machines, vacuum cleaners and various other specialties. E. V. Brown succeeds Mr. Holst in the Iowa territory.

C. H. RITTER, owing to changes made and reorganization in the office, has been made manager of the supply department.

GOVERNMENT CONTRACTS. — The General Supplies Division of the Quartermaster's Department, Munitions Building, Potomac Park, Washington, is calling for bids on or before Nov. 14 for two alternating-current 110-volt motors (no size given), four 220-440-volt electric irons, eight sewing machines with 220-volt motors, 160 soldering irons, two sewing machines with 110-volt direct-current motors and one 16-lb. flatiron complete.

ONLY ONE COPY OF EXPORT APPLICATION FORMS REQUIRED.—The War Trade Board calls the attention of exporters to the fact that in submitting applications for export licenses only one copy of form X and of any supplemental form is required. The only documents of which more than one copy is required are the lists of commodities which in some cases are attached to form X in answer to question 5. These lists must be furnished in triplicate.

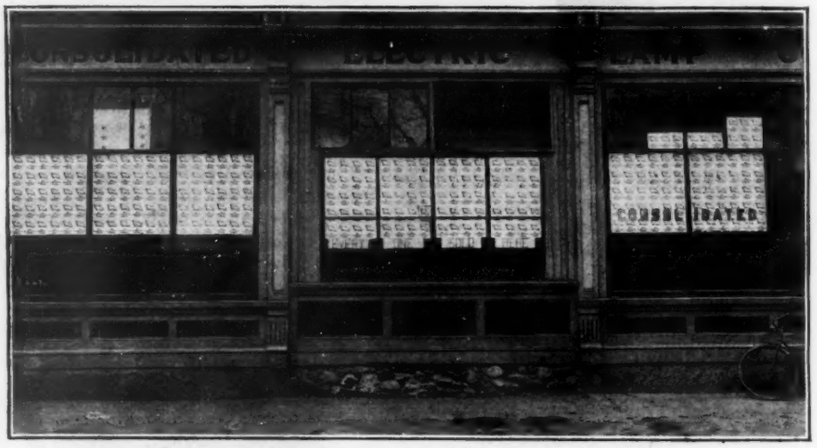
INDUSTRIAL PLANT SURVEY.—A survey of all industrial plants producing war materials will shortly be undertaken at Boston under the supervision of E. W. Lord, state director of the federal employment service. The work will be done by the federal office organization instead of by community effort, as at first considered, in the interest of greater speed and better systematization of data. The detail of the work calls for figures on the amount of labor and material used, with the object of establishing a reservoir of information which will enable advantage to be taken of any surplus on hand from time to time in any local plant.

LYNN-G. E. LABOR FINDING.—The National War Labor Board has made public its findings in regard to the labor situation at the Lynn plant of the General Electric Company. The right of the workers to organize in trade unions and bargain collectively through a chosen representative is recognized and affirmed. This right shall not be denied, abridged or interfered with by the employer in any manner whatsoever. The board's decision provides for the election of shop committees and election supervisors and the creation of a general committee which will meet to adjudicate wage and labor questions. Hours of labor are to be the same as those at the Schenectady plant of the company, with comparable pay.

BRITISH EXPORTS OF ENGINEERING APPLIANCES.—In discussing export of engineering machines, Leonard Andrews in the *Journal* of the British Institution of Electrical Engineers for June, 1918, states that there is abundant evidence that results fall very short of possible attainment. A large amount of machinery and engineering appliances of all descriptions is imported into Canada every year, but it is estimated that less than 5 per cent of these imports that come in are manufactured in the United Kingdom. It is the author's opinion that maximum efficiency will only be attained by grouping the various elements upon which successful overseas trade is dependent under three self-contained, closely allied and interconnected sections which may be classified as production, coordination and distribution. The author also points out that the national welfare of the British Empire is so dependent upon the engineering industries that the use of state credit for the purpose of improving the overseas distribution of engineering appliances appears to be justifiable.

LIST OF FOREIGN IMPORTERS AND DEALERS.—The Bureau of Foreign and Domestic Commerce, Washington, D. C., is constantly receiving lists of importers and dealers in all kinds of articles throughout the world. Therefore it is suggested that American manufacturers and exporters should first ascertain whether a list desired is on hand at the bureau before writing to the consuls.

NOW POSSIBLE TO GET MANGANIN OF AMERICAN MANUFACTURE. —The Leeds & Northrup Company, Philadelphia, manufacturing electrical measuring instruments, announces that it has recently completed experiments which have taught it the exact process of making on a commercial scale manganin of a grade superior to any which has in the past years come from Germany. Prior to the war all manganin was imported from Europe, and as a result the stocks after the war rapidly became exhausted, so that instrument manufacturers were of necessity forced to use substitutes which were not altogether satisfactory. The Leeds & Northrup Company has now made arrangements with a metal manufacturer to produce manganin, and the company states that it has already been furnished in all sizes of a superior quality from large rods to the smallest wire.



LIBERTY LOAN DISPLAY WINDOW OF DANVERS (MASS.) COMPANY

LIBERTY LOAN DISPLAY.—The Consolidated Electric Lamp Company of Danvers, Mass., was very active in its appeal to the community in which it is established for Liberty bond subscriptions. The effective massed display of loan posters in the company's window is shown on this page.

EXPORT CONSERVATION LIST.—An amended Export Conservation List, effective Oct. 15, has just been distributed. To export articles on this list licences must be obtained, and where followed by an X supplementary information forms with these numbers must be used. The suggestion is made by the War Trade Board that applications for export licenses must be accompanied by adequate descriptions of the constituents of the commodities mentioned in the application. Trade names for commodities should be avoided unless the name conveys a generally accepted description of the article. The list includes the following items of interest to the electrical trade, all of which must use supplemental form X-2: Copper wire (individual licenses not required to Canada and Newfoundland), carbon and graphite electrodes, electrolytic cells, searchlight reflectors, parts and generators.

REVISED PROCEDURE FOR LICENSING SHIPMENTS.—The War Trade Board announces the revision, effective Nov. 1, 1918, of the procedure set forth in W. T. B. R. 184, dated Aug. 3, 1918, for the issuance of export licenses for shipments which are (a) destined to the United Kingdom, France, Italy or Belgium (excluding their colonies, possessions and protectorates), either directly or by way of any other country or colony, or (b) destined to any country or colony by way of the United Kingdom, France, Italy or Belgium, excepting shipments destined to Switzerland by way of France or Italy. The change in the procedure is in regard to the manner of granting licenses for the exportation of commodities to France. The French government, owing to the shortage of tonnage, has instructed the French High Commission in this country to indorse applications for export to France only when definite instructions have been received from the French government that such indorsement should be given. Full details are to be found in W. T. B. report 293.

NEW ESTERLINE REPRESENTATIVE.—The Esterline Company has just completed arrangements with the Electrical Sales Engineers, Inc., 19 South Fifth Avenue, Chicago, to act as its exclusive representative in northern Illinois and Indiana. Paul W. Koch is president and general manager of the Electrical Sales Engineers, Inc., and has had a long experience in the electrical field. The concern's engineers have made a special study of the construction and use of Esterline instruments and are well qualified to give assistance or information in connection with the solution of metering problems. The Esterline Company has appointed the C. B. Fall Company, 2046 Railway Exchnge Building, St. Louis, its exclusive representative for the State of Missouri and southern Illinois. C. B. Fall, president of the company, is an experienced instrument man, having received his early training in the laboratory of the Esterline Company. For a number of years he was in charge of meters and testing for the Indianapolis Light & Heat Company.

RIGHTS OF PRICE CUTTERS DENIED.—In the Federal District Court for the Eastern District of Virginia, Colgate & Company were upheld in their practice of refusing to sell to retailers who persistently cut published prices. The court held that the manufacturers had an interest in the resale price. "Price cutting," said the court, "would almost inevitably result in reducing the defendants' business in a given community to only those engaged in that practice and deprive it of the patronage of the great body of wholesalers and retailers engaged in what they believed to be a fair and legitimate conduct of their business. It by no means follows that, in the end, the public would be benefited as the price cutter could easily raise his prices after the demoralization caused by his conduct had been brought about and profit individually by so doing. What the public is interested in is that only reasonable and fair prices shall be charged for what it buys, and it is not claimed that the defendant's manner of conducting their business has otherwise resulted."

THE GENERAL ELECTRIC COMPANY OF GREAT BRITAIN desires to announce that it has completed the purchase of the Erith Works and of the good will of the manufacturing business hitherto carried on by Fraser & Chalmers, Ltd. Practically the whole of the personnel have transferred their services to the General Electric Company, which will carry on the business as a going concern and under the title of Fraser & Chalmers Engineering Works.

THE INTERNATIONAL WESTERN ELECTRIC COMPANY, which was organized recently to conduct the Western Electric Company's foreign business, has done a vast amount of war work. Fully one-third of its business is the supplying of materials which are used directly by the fighting forces of the United States and its allies. The materials for the Allied armies have been supplied as the result of orders received through the company's houses in

London, Paris and Milan and through the various purchasing commissions maintained by the Allied governments in this country. The American, French, British and Italian armies all are being supplied through these channels.

C. R. HORRELL, who was formerly with the Electric Appliance Company at Chicago, has been made assistant sales manager of the Sangamo Electric Company, Springfield, Ill.

LANDERS, FRARY & CLARK, New Britain, Conn., had a fire in their plant on Oct. 29, caused by an explosion in the celluloid vault. The loss is placed at approximately $15,000.

THE BAKER-JOSLYN COMPANY, manufacturers' agent, announces the removal of its San Francisco office and warehouse to 183-199 First Street. There is no change of address of the Seattle or Los Angeles branches.

ARTURO R. CALVO, for the last five years manager of sales of the Permutit Company, has resigned to become an officer and director of the Hercules Engineering Corporation and its affiliated interests, the Electrolytic Engineering Corporation and the Technical Products Company.

W. A. HARLACHER, who was recently appointed manager for the Chicago Electric Lamp Company, 136 West Lake Street, Chicago, was formerly employed with the United States Incandescent Lamp Company, the Westinghouse Lamp Company and the Sterling division of the General Electric Lamp Company.

E. I. VAN DOREN, who for several years past has been at 332 River Street, Troy, N. Y., with a line of electric motors and supplies, announces the opening of his new ground-floor store, "The Edison Shop," on or about Nov. 9 at 81 Fourth Street, where he will offer a new and varied line of electric motors, "Mazda" lamps, heating devices, etc.

THE HABIRSHAW ELECTRIC CABLE COMPANY has rented two buildings in Yonkers, which it is equipping with machinery to take care of government work, particularly the manufacture of outpost wire. The government is asking the wire industry to turn out 65,000 miles of this outpost wire a month. Present manufacturing facilities are inadequate, particularly in braiding machines, to meet entirely the demands of the government, and additional machinery such as is being provided by the Habirshaw company will be necessary.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, automobile equipment department, announces that on Dec. 1, it will close its Indianapolis office, at 512 Merchants' Bank Building, until after the war. The business for both the Indianapolis and Chicago districts will be handled out of Chicago. The automobile equipment department's office will be combined with the general offices of the company in the Conway Building, Clark and Washington Streets, Chicago. Prescott C. Ritchie, at present in charge of the Indianapolis office, will take charge of the office in the new location. In addition to soliciting equipment business for passenger cars and trucks, arrangements are being made to give special attention to the tractor field.

THE WETMORE-SAVAGE COMPANY, electrical jobber, Boston, is sending a neat leaflet to the trade pointing out the difficulties which must be overcome in order to render the best possible service in the face of the labor shortage resulting from the entrance of employees into the army and navy. Forty-four of the company's staff are now in the national service, as indicated in a border of service stars printed on the leaflet. The company calls attention to the spirit in which these employees quit their homes and their civilian work and to the earnest efforts of those who have taken up their duties during their absence to become acquainted with the individual needs of their customers. The patience and consideration of the trade are urged in cases where delays or other annoyances arise from the absence of regular staff members, and constructive criticism is welcomed. The fact that Uncle Sam has "the right of way" in materials, transportation and in everything that can help crown the Allies' efforts with victory, is also noted as a reason for temporary inconveniences. In manly fashion the bulletin emphasizes the company's intention to do its best for the trade, pointing out that if shipments are delayed or if mistakes sometimes occur, those whose skill and experience could have prevented these things are now fighting our battles for us across the water. The coöperation of the trade is cordially sought in meeting the present difficult situation.

THE CHICAGO PNEUMATIC TOOL COMPANY announces the appointment of A. M. Brown as district manager of sales, 1740 Market Street, Philadelphia, succeeding G. A. Barden, who remains in Philadelphia as sales representative for the company. For some time past Mr. Brown has been stationed in the New York offices of the company as assistant manager of the compressor sales division.

THE NATIONAL ELECTRIC & WELDING COMPANY, 90 West Street, New York, has been appointed New York sales agent for the C & C Electric & Manufacturing Company and has also been appointed Eastern sales agent for the Wesche Electric Company of Cincinnati. The personnel formerly connected with the New York sales office of the C & C Electric & Manufacturing Company is now handling both C & C and Wesche machinery, the lines of apparatus having been extended to include alternating-current and direct-current equipment, arc welders, etc.

Trade Publications

LIGHTING PLANTS.—Illustrations and descriptions of a light and power plant suitable for foreign markets are given in a two-color folder of the Essandee Corporation, 39 South La Salle Street, Chicago.

MOTORS.—The methods of merchandising Phoenix motors are told in a circular of the Phoenix Electric Company which contains pictures of a number of applications to which these motors have been put.

COMPRESSORS.—In bulletin C-5 portable and stationary air compressors equipped with economical oiling systems are described, illustrated and priced by the Curtis Pneumatic Machinery Company of St. Louis.

FUSES.—The M. B. Austin Company, 700 West Jackson Boulevard, Chicago, has issued a broadside in red, white and blue telling of the installations of its fuses in shipyards, munition plants and other large industrial institutions.

WASHING MACHINES.—A bulletin has been issued by the Oshkosh Washing Machine Company, Oshkosh, Wis., showing the parts of a machine disassembled. This is to aid dealers in ordering repair parts or making slight adjustments.

REFLECTORS.—Many styles of interchangeable steel reflectors, holders, sockets, covers and clamps for different kinds of industrial lighting with 100-watt type "C" lamps are illustrated in a folder from Harvey Hubbell, Inc., of Bridgeport, Conn.

CHAIN DRIVES.—A silent drive for textile mills is illustrated and described in "A Chain of Evidence," publication No. 13 from the Morse Chain Company of Ithaca, N. Y. Front-end drives for automobile engines are also described with illustrations in another publication.

VACUUM PUMPS.—Bulletin No. 107 of the J. P. Devine Company, Buffalo, N. Y., illustrates and describes dry vacuum pumps of the rotary and slide valve types, together with wet vacuum pumps, jet condensers and complete drying outfits for industrial and laboratory use.

COPPER PRODUCTS.—The uses of its blue vitriol in electric batteries of the "gravity" type in wire mills, etc., and other of its copper products are briefly mentioned in a recently issued booklet of the Nichols Copper Company, 25 Broad Street, New York City.

INDICATING INSTRUMENTS. — The Esterline Company, Indianapolis, has issued a folder illustrating and describing type "W" duplex instruments which are combinations of ammeters and voltmeters or wattmeters and ammeters or voltmeters in a single case.

SEARCHLIGHT.—A number of two-color folders have been issued by the F. W. Wakefield Brass Company of Vermilion, Ohio, describing the "Red-Spot double-duty searchlight," the light of which can be converted from an ordinary white beam into a red danger signal.

ELECTRIC POLISHING AND GRINDING.—Motor-driven machines for polishing and grinding on both direct-current and alternating-current circuits are described and illustrated in a sixteen-page booklet issued by Roth Brothers & Company, Adams and Loomis Streets, Chicago.

FUSES.—The "Trico" renewable cartridge fuse is illustrated and described in a circular of the M. B. Austin Company of 700 West Jackson Boulevard, Chicago.

SWITCHES.—Preventing accidents that delay production by means of "Square D" steel inclosed switches is the subject of a folder issued by the Square D Company of Detroit, Mich.

GROUNDING APPARATUS.—The Paragon Electric Company, Old Colony Building, Chicago, has issued a twenty-four-page booklet giving engineering information on grounding for telephone systems, telegraph systems, railway signal installations, lighting and power circuits and trolley circuits.

MARINE LIGHTING AND SIGNALING APPARATUS.—Additional information sheets and a new price list for insertion in its marine lighting and signaling apparatus catalog are being mailed by the Benjamin Electric Manufacturing Company, 806 West Washington Boulevard, Chicago.

MOTORS.—A catalog published in Spanish is being issued by Roth Brothers & Company, Adams and Loomis Street, Chicago. It illustrates and describes in detail the construction of the company's motors and generators for direct-current circuits and discusses the application of the motors to the more common machine tools. Motor-generators and alternating-current motors are also listed.

DIRECT LIGHTING. — The National X-Ray Reflector Company, Chicago, has published catalog No. 21, describing its direct lighting reflectors. This catalog covers all X-ray reflectors for industrial, flood, show-window and showcase lighting. In order to observe the government's regulations on paper conservation there has been no general mailing of this catalog. It is being sent only upon request.

ENGINEERING SERVICES.—The consulting engineering firms of Charles L. Pillsbury Company, Minneapolis, and Vaughn & Meyer, Milwaukee, have issued a 130-page booklet to point out the advantages of consulting engineering services. The booklet covers the following functions of the consulting engineer: Preliminary conferences, preliminary survey, designs, technical conferences, plans and specifications, business conferences, supervision, tests, accounting, completion, inspections and miscellaneous.

New Incorporations

THE RELIABLE ELECTRIC PLATING COMPANY of West Orange, N. J., has been chartered with a capital stock of $50,000 by Joseph Danbeck, Helen Danbeck and Adolph Danbeck, all of West Orange, N. J.

THE ELECTRIC TRANSPORT COMPANY of New York, N. Y., has been incorporated by J. C. Norris, R. Sugden and W. A. Anderson. The company is capitalized at $100,000 and proposes to manufacture motor-driven conveying equipment, underground carriers, etc.

THE LINCOLN METER COMPANY of Toronto, Ont., Can., has been incorporated with a capital stock of $100,000 to manufacture electric meters, electrical machinery, devices, etc. The incorporators are Edwin G. Long, corner Bay and Melinda Streets; Harry S. Sprague, Albert Means, and others.

THE ARCWELL CORPORATION OF CANADA of Toronto, Ont., has been incorporated by Arthur L. Reid, 1126 Traders' Bank Building; William W. Perry, Charles H. C. Leggott and others. The company is capitalized at $1,000,000 and proposes to manufacture electrical machinery, generators, storage batteries, appliances, etc.

THE NAGARA FALLS (N. Y.) POWER COMPANY has been incorporated with a capital stock of $26,000,000 by F. Chormann, N. Biddle and E. D. Adams, 71 Broadway, New York, N. Y. The company is a consolidation of the Cliff Electrical Distributing Company, the Niagara Falls Power Company and the Hydraulic Power Company of Niagara Falls.

THE ELEVATOR ENGINEERING COMPANY of New York, N. Y., has been incorporated with a capital stock of $25,000 to manufacture elevating and conveying systems for handling coal, sand, grain or other bulk commodities. The incorporators are W. Valis, 2023 Washington Avenue; H. Pearsall, 315 East 175th Street, and A. S. Mayer, 208 East Tremont Street, New York City.

New England States

BRISTOL, ME.—Plans are being considered by the Village Improvements Association for lighting the streets by electricity. The Lincoln County Power Company of Damariscotta supplies electrical service in Bristol.

SKOWHEGAN, ME.—The Central Maine Power Company, it is understood, will take over the pulp mill of the Skowhegan Pulp Company about Jan. 1. The power company, it is reported, will install electric generating equipment in the basement of the building to supplement its hydroelectric power at this point.

LACONIA, N. H.—The Laconia Gas & Electric Company has purchased the water rights at Profile Falls, near Hill, for the purpose of establishing a hydroelectric plant. Surveys have been made and plans prepared for developing the power at the falls and transmitting it to Laconia. Nothing, it is understood, will be done in regard to the project until after the war.

METHUEN, MASS.—The City Council is considering the installation of additional street lamps in different sections of the city. Street-lighting service is supplied by the Lawrence (Mass.) Gas Company.

SALEM, MASS.—The State Gas and Electric Light Commission has granted the Salem Electric Lighting Company permission to issue $113,050 in additional capital stock.

SPRINGFIELD, MASS.—Congress has been asked for an appropriation of $35,000 for the construction of an aërial tramway, a target house and a storehouse at the Springfield Armory.

EAST HAMPTON, CONN.—Plans have been prepared by the Central Connecticut Power Company for the construction of an addition to its power station at Leesville on the Salmon River. Jenks & Ballou, 735 Grosvenor Building, Providence, R. I., are engineers.

STAMFORD, CONN.—The entire power plant and a section of the works of the Waterside Mills were recently destroyed by fire, causing a loss of about $100,000. The company, it is said, will rebuild at once.

Middle Atlantic States

BUFFALO, N. Y.—Plans have been completed by the Pierce Arrow Motor Car Company for the construction of testing works, reassembling plant and boiler house on the Niagara River Road at Tonawanda.

BUFFALO, N. Y.—Revised plans are being prepared for the construction of the proposed charging plant of the Prest-O-Lite Company to be located at Colgate Avenue, Hopkins and Tifft Streets. The plans provide for the erection of four one-story buildings.

BUFFALO, N. Y.—Work is progressing rapidly on the construction of the new factory and power plant of the General Electric Company of Schenectady, to be located on Fillmore Avenue. The cost of the work is estimated at about $200,000.

HERKIMER, N. Y.—Arrangements are being made by the Municipal Commission for the erection of an addition to the municipal boiler plant, to cost about $50,000. H. B. Smith, Clarendon Building, Utica, is architect and engineer for the commission.

NEW YORK, N. Y.—Plans have been filed by the United Electric Light & Power Company, 130 East Fifteenth Street, for the erection of a new power station, screen and well house. Contract has been awarded to the Kenwell Contracting Company, 841 Broadway.

NEW YORK, N. Y.—The Bureau of Yards and Docks, Navy Department, Washington, D. C., is planning to install coal and ash-handling equipment, to cost about $80,000 (Specification 3607); the installation of two electric traveling cranes, to cost about $12,000 (Specification 3609); extension to fire protection system at section base, to cost about $5,000 (Specification 3591), and to rebuild shipway No. 1 at a cost of about $400,000 (Specification 3590).

ROCHESTER, N. Y.—The Construction Division of the War Department, Washington, D. C., contemplates the construction of hospital buildings at Expedition Park, to cost about $200,000.

WESTCHESTER, N. Y.—The Construction Division of the War Department, Washington, D. C., contemplates the erection of hospital buildings at Westchester, to cost about $250,000.

DOVER, N. J.—The Radium Luminous Material Corporation of Boonton has awarded a contract to the New Jersey Power & Light Company for additional electric power to increase operations at its plant.

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

ELIZABETH, N. J.—The Elizabethtown Water Company is negotiating with the State Board of Conservation and Development for permission to erect a motor-driven pumping station above the Landing Bridge in the vicinity of Milltown, to cost about $150,000.

HOBOKEN, N. J.—A portion of the plant of the F. J. Rooney Lamp Company, Thirteenth Street and Willow Avenue, was recently destroyed by fire, causing a loss of about $8,000. The company manufactures electric bulbs for the government.

MAY'S LANDING, N. J.—Contract has been awarded to Cramp & Company, Denckla Building, Philadelphia, Pa., for the construction of an electric power plant at the shell-loading plant at May's Landing. The plant will consist of twelve units to form the main works and will be operated by the Bethlehem Loading Company, a subsidiary of the Bethlehem Steel Company.

NEWARK, N. J.—The Rubber & Celluloid Products Company, Wilson Avenue, is planning to rebuild its plant, recently destroyed by fire. The loss is estimated at about $100,000.

NEWARK, N. J.—Plans have been filed by Baker & Company, 54 Austin Street, for the construction of an addition to the engine room of their power plant, 24 ft. by 37 ft., at 416-18 New Jersey Railroad Avenue, to cost about $8,400. Contract has been awarded to Fred Kilgus, 13 South Sixth Street.

ELDERSVILLE, PA.—Contract has been awarded by the Superior Coal Company to the McDonald (Pa.) Electric & Fixture Company for the installation of an electric lighting system in its new town near Eldersville. The contract includes wiring all the houses, finished and under construction, of the Superior company for electricity. Thirty street lamps will be installed.

HAZLETON, PA.—The Cranberry Coal Company has nearly completed an electrical installation at the Cranberry mine, at a cost of nearly $1,000,000.

MARKLETON, PA.—Plans are under consideration for the installation of a new heating system in the local United States hospital building.

PHILADELPHIA, PA.—The Bureau of Yards and Docks, Navy Department, Washington, D. C., is planning to install mechanical stokers at the local navy yard, to cost about $51,000 (Specification 3586).

PHILADELPHIA, PA.—Plans are being considered by the William Cramp & Sons Ship & Engine Company, Beach and Palmer Streets to erect a new engine house, 306 ft. by 400 ft., to cost about $100,000.

PHILADELPHIA, PA.—Work has begun on the erection of the proposed new boiler plant at the works of the Baugh & Sons Company, 20 South Delaware Avenue. The cost is estimated at $20,000.

PHILADELPHIA, PA.—A section of the main power house at the Frankford Arsenal was recently destroyed by fire, including the coal-conveying system. It is understood that it will be rebuilt at once.

PHILADELPHIA, PA.—Plans have been prepared by the Philadelphia Rapid Transit Company, 810 West Dauphin Street, for the installation of two new electrically operated cranes and for other alterations and improvements in its repair shop at Frankford Avenue and Bridge Street. The cost of the entire work is estimated at $45,000.

PITTSBURGH, PA.—The West Penn Power Company has engaged Sanderson & Porter, 52 William Street, New York, N. Y., as designing engineers and to supervise the construction of its proposed power plant at Springdale, to cost $5,000,000. The government has advanced $2,000,000 for the project.

BALTIMORE, MD.—Contract has been awarded by the Baltimore & Ohio Railroad, Company to W. Dwyer, Second National Bank Building, Cincinnati, Ohio, for construction of engine house and shop at Keyser, W. Va., to cost $200,000 and for an engine house at Clarksburg, W. Va.

BALTIMORE, MD.—The Mount Vernon-Woodberry Mills, 506 Continental Building, has awarded general contract for construction of power house, 40 ft. by 100 ft., to Gladfelter & Chambers, Thirty-sixth Street and Roland Avenue, Baltimore. Plans were prepared by Joseph Evans Sperry, Calvert Building, Baltimore.

ELKINS, W. VA.—Contract has been awarded by the United States Railway Administration to the Price Construction Company, Maryland Trust Building, Baltimore, Md., for the construction of railway shops in Elkins for the Western Maryland Railroad Company, to cost about $500,000. H. R. Pratt, Continental Building, Baltimore, is engineer.

SOUTH CHARLESTON, W. VA.—Steps have been taken by local business men to organize a company to establish and operate an electric light plant in South Charleston and surrounding communities. Electrical service is now furnished from the plant of the West Virginia Water & Electric Company of Charleston.

SWISS, W. VA.—The Kanawha Collieries Company, Charleston National Bank Building, Charleston, it is reported, would like to receive prices on equipment for power plant at its local mines.

NORFOLK, VA.—The Bureau of Yards and Docks, Navy Department, Washington, D. C., contemplates the installation of mechanical stokers at the local navy yard, to cost about $24,000.

WASHINGTON, D. C.—Plans are under consideration by the Construction Division of the War Department, Washington, D. C., for the construction of an emergency hospital, to cost about $1,000,000.

WASHINGTON, D. C.—Contract has been awarded by the Bureau of Yards and Docks, Navy Department, Washington, D. C., for the construction of an emergency hospital, to cost $300,000, to the Turner Construction Company, Twenty-third and B Streets, Washington.

North Central States

DETROIT, MICH.—Plans are being prepared by the Detroit Copper & Brass Rolling Mills for an addition to its plant, to cost about $50,000.

DETROIT, MICH.—Plans, it is reported, are under consideration by the Packard Motor Car Company, Boulevard and Belt Line, for the construction of an erecting plant and an enameling plant, to cost about $700,000 and $75,000, respectively.

ISHPEMING, MICH.—Plans are under consideration by the Cleveland-Cliffs Iron Company of Ishpeming for the construction of two electric power plants, to be located at its works at Ishpeming and Republic.

LANSING, MICH.—The entire plant of the Olds Motor Works will be devoted to aircraft production and the manufacture of Liberty motors. The cost of converting and equipping the plant for the work is estimated at $1,250,000.

PORT HURON, MICH.—Bids will be received by the City Commission, City Hall, Port Huron, until Nov. 20 for furnishing pumping equipment, including two motor-driven centrifugal pumps, each of 6,000,000 gal. capacity in twenty-four hours, one 24-in Venturi meter with indicator, register and recorder, water valves, valves and pump fittings, etc. Lorrain C. Elliott is city clerk.

RAVENNA, MICH.—Plans are under consideration for the installation of a small electric light plant in Ravenna next spring. C. E. Alberts is interested.

CLEVELAND, OHIO—Contract has been awarded by the Cleveland Welding & Manufacturing Company to the Hunkin-Conkey Construction Company of Cleveland for the construction of a new power house, 80 ft. by 100 ft.

LORAIN, OHIO—Plans have been prepared by L. G. Findlay, engineer, 503 Union Building, Cleveland, for the construction of a chemical plant, consisting of six one-story and two-story buildings in Lorain, for the Cleveland Salt Company, 5912 Central Avenue, Cleveland. The cost is estimated at about $200,000.

BURGIN, KY.—The proposal to install a municipal electric light plant in Burgin will soon be submitted to the voters. S. D. Ison is city clerk.

LOUISVILLE, KY.—The Louisville Gas & Electric Company is contemplating extensions and improvements to its plant to enable it to supply energy for war industries.

LOUISVILLE, KY.—Plans are under consideration by the Gordon-Miller Coal & Coke Company for the erection of a power plant and to install electrically driven machinery.

SMITH'S GROVE, KY.—The Smith's Grove Light & Ice Company has erected a high-tension transmission line to Bowling Green, and has contracted with the Kentucky Public Service Company for electricity to operate its system. The local generating plant of the company has been dismantled.

EAST CHICAGO, IND.—The International Lead Company is contemplating the construction of a new pumping station and boiler plant at its local plant, to cost about $20,000. Bids, it is understood, have been received for the works.

LOGANSPORT, IND.—Contract will soon be awarded by the Logansport Heat & Power Company for the erection of a high tension transmission line to supply electricity for lamps and motors in the towns of Winamac, Royal Center and Star City. The cost of the improvements to the plant and construction of transmission line is estimated at $75,000. The line is to be completed by Jan. 1, 1919. F. L. Good is manager.

PEORIA, ILL.—Extensions and improvements are being made to the plant of the Holt Manufacturing Company, including the installation of a power plant.

PEORIA, ILL.—The Central Illinois Light Company and the Canton (Ill.) Gas & Electric Company have petitioned the Public Utilities Commission for permission to connect their lines.

APPLETON, WIS.—Plans are being prepared by Arthur J. Sweet, engineer, Palace Theater Building, Milwaukee, for extensions to the street-lighting system.

CLINTONVILLE, WIS.—The Clintonville Power Company has been organized by interests connected with the Topp-Stewart Tractor Company of Clintonville to take over the new hydroelectric power plant under construction at Heyman Falls on the Embarrass River. The company will supply electricity for industrial and domestic purposes. Levi C. Larson, Dr. Charles Topp, L. Cole, H. F. Zarling and Frank Buchholtz of Clintonville, and others, are interested in the company.

SUPERIOR, WIS.—The United States Steel Corporation is reported to be considering the construction of four fabricating plants in Superior, to cost about $15,000,000.

ST. PAUL, MINN.—Bids, it is reported, are being received by H. P. Smith, president of the Northern Pacific Benefit Association, 203 Railroad Building, St. Paul, for the construction of a hospital and power plant, to cost about $300,000.

MAQUOKETA, IOWA—At an election held recently the proposal to issue $65,000 in bonds for the installation of a municipal electric light plant was carried.

INDEPENDENCE, MO.—The Independence Airless Company is planning to equip a plant for the manufacture of airless inner tubes and is reported to be in the market for machinery, motors, boilers, vulcanizers, engine, etc.

JOPLIN, MO.—The new-250-ton milling plant of the Bankers' Mining Company, now in course of erection at its properties near Bell Center, will be equipped with electrically operated machinery.

KANSAS CITY, MO.—Plans are nearly completed and bids will soon be asked for the construction of children's building, laundry, garage and power house building for the children's home at Sixty-eighth Street and Troost Avenue, owned by the House of the Good Shepherd. H. F. Holt, 315 East Tenth Street, Kansas City, is architect.

ST. LOUIS, MO.—Contract has been awarded by the Oliver Electric Manufacturing Company to Amber & Zimmerman, 1228 Pine Street, for the construction of a new plant, to cost about $45,000.

ST. LOUIS, MO.—Plans have been prepared by G. P. Wuest, architect, Wainwright Building, for the erection of a laboratory building, 60 ft. by 100 ft., for the Pan Electric Manufacturing Company, 735 South Fourth Street.

MUNICH, N. D.—The Dakota Valley Engineering Company of Valley City has been awarded contract for the installation of an electric light system in Munich. The plant will be installed this fall.

LIBERTY, NEB.—Plans are under consideration by the town officials for the erection of an electric transmission line to Pawnee City to secure electricity to operate the local system. L. E. Baldwin is engineer of the municipal system.

OMAHA, NEB.—Bids, it is reported, are being asked for electric wiring, plumbing and other sub-contracts for the new packing plant of the Skinner Packing Company, to be erected in South Side. The cost of plant is estimated at $1,500,000. Collins Brothers, Rialto Building, Kansas City, Mo., have the general contract.

DORRANCE, KAN.—The proposal to issue $10,000 in bonds for improvements to the municipal electric lighting system will be submitted to the voters.

HUTCHINSON, KAN.—Contract has been awarded by the Barton Salt Company of Hutchinson to the Stamey-Mackey Construction Company for construction of additions to its plant, including coopershop, evaporator room, boiler room and installation of two Stirling boilers. The cost of the work is estimated at $50,000.

LURAY, KAN.—Preparations are being made for the installation of a municipal electric light plant. George H. Wells will have charge of the plant.

Southern States

ATLANTA, GA.—The Southern Iron & Equipment Company, Grant Building, Atlanta, it is reported, would like to receive prices on a 140-hp. to 175-hp. oil or Diesel type engine directly connected to a three-phase, 60-cycle, 220-volt generator; higher voltage could be used. Also an 80-hp. to 90-hp. oil or Diesel type engine suitable to connect to generator.

SPRINGFIELD, GA.—Surveys are being made of the local creek with a view of developing the water power and supplying electricity to the city of Springfield and to industrial plants. R. M. Davison and others are interested.

SUMMERVILLE, GA.—Steps have been taken to organize a company to establish an electric light plant in Summerville. The company will be known as the City Light & Power Company and is to be capitalized at $7,500. Work, it is understood, will begin at once on the installation of the system. John D. Taylor, president of the Summerville Cotton Mills, is interested in the project.

CUTLER, FLA.—The War Department, Washington, D. C., is planning to erect two additional units at the army aero gunnery school, for which $650,000 has been appropriated.

PENSACOLA, FLA.—The Bureau of Yards and Docks, Navy Department, Washington, D. C., is contemplating an expenditure of $180,000 for housing personnels (Specification 3534).

MONTGOMERY, ALA.—The property of the Montgomery Light & Traction Company, including the electric lighting plant and street railway system, it is reported, has been purchased by Isadore Newman & Sons of New Orleans, La. Improvements involving an expenditure of about $250,000 to the street railway, etc., it is understood, are contemplated by the new owners.

WAYNE, ALA.—Improvements are contemplated to the municipal electric light plant involving an expenditure of about $25,000. Post office address, R. F. D. Dixons Mills.

LAMBERT, MISS.—The Council has granted the Quitman Light & Power Company of Marks a franchise to supply electricity in Lambert for a period of twenty-five years.

TUTWILER, MISS.—The proposal to issue bonds for the installation of a municipal electric light plant will soon be submitted to the voters.

HAVANA, ARK.—Kyle & Company, it is reported, are planning to install an electric light plant to supply electricity for lighting the city.

NEW ORLEANS, LA.—The War Department is reported to be considering a chlorine plant in New Orleans to manufacture poison gas for shells and bombs, to cost about $10,000,000. For further information address Major H. H. Hanson, Chemical Welfare Service, care of Mayor Behrman, New Orleans.

SEMINOLE, OKLA.—Arrangements have been made by the city officials with the Ada Electric & Gas Company for furnishing electrical service in Seminole. Work will soon begin on the erection of the transmission line.

SAN ANGELO, TEX.—C. C. McBurnett is reported to be considering the construction of an electric plant, to cost about $12,000, for the Angelus Hotel.

Pacific and Mountain States

SEATTLE, WASH.—The Forest Service has granted the American Nitrogen Products Company, Securities Building, Seattle, a preliminary permit for the location of power sites on the Sauk and Suittle Rivers, tributaries of the Skagit River, in western Washington. The company operates a nitrogen products plant at La Grande.

SEATTLE, WASH.—A preliminary permit has been granted the Sound Power Company, a subsidiary of the Sound Paper Company, both of New York, N. Y., for the development of power in the National Forest Reserve in western Washington. H. O. Pond of New York, N. Y., is president of the company.

PORTLAND, ORE.—A site of 32 acres has been purchased at Wilbridge station, on the Columbia River, on the outskirts of Portland, by the Pacific Steel Company, on which it proposes to erect a steel plant. The equipment will include two open-hearth furnaces of 40 tons capacity each and two rolling mills. The plant will be equipped with electrically operated machinery. Energy for operating the proposed plant will be purchased. J. P. English is manager. The office of the company is located in the Northwestern Bank Building, Portland.

TILLAMOOK, ORE.—The Great Power Company of Tillamook will soon place in operation a 20-mile electric transmission line from Tillamook to Brighton. This line will supply electricity to operate the planing mill of the Brighton Mills Company.

CAMP KEARNEY, CAL.—The Construction Division of the War Department, Washington, D. C., is considering an addition to Camp Kearney, consisting of barracks, mess halls, hospital, etc., to cost about $2,000,000.

LOS ANGELES, CAL.—Work has begun on the installation of machinery in the municipal power plant just below the Haiwee reservoir. The plant will have an output of 1600 hp. and will be tied into the Owens Valley power system, now supplying energy to Independence, Lone Pine and the mines and soda industries on the shores of Owens Lake. It is expected to have the plant in operation by Jan. 1, 1919.

ONTARIO, CAL.—Plans are being prepared for the erection of a power house in the San Antonio Canyon above Hogsback for the Ontario Power Company, to cost about $60,000. Glenn D. Smith is general manager.

SAN DIEGO, CAL.—Plans are under consideration by the Bureau of Yards and Docks, Navy Department, Washington, D. C., for additional buildings at the Naval Air Station, to cost about $410,000 (Specification 3611).

STOCKTON, CAL.—Contract has been awarded by the Stockton Wool Scouring Company to the Western States & Electric Company for furnishing electricity to operate its plant. The contract is for a period of five years, and about 150 hp. in motors will be required. The company now uses steam power.

PHOENIX, ARIZ.—Plans are under consideration by the Salt Water Valley Users' Association of Phoenix for the installation of 60 electrically operated pumping plants in the Salt River Valley section. W. R. Elliott is manager.

WHITEFISH, MONT. — Contract has been awarded by the Great Northern Railway Company to the Mountain States Power Company of Big Fork for furnishing electricity to operate the turntable at its local roundhouse.

Canada

SYDNEY, N. S.—The Dominion Iron & Steel Company of Sydney has awarded contract for construction of engine house, to cost $80,000, to Chappell Brothers & Company, Brookland Street.

COLLINGWOOD, ONT. — The Hydro-Electric Commissioners are considering an extension of the hydroelectric transmission line to Nottowa and installing an electric lighting system there. H. A. Currie is chairman of the commission.

GREAT FALLS, ONT. — The Great Northern Railway Company is considering improvements to its local yards, including the erection of new shops, to cost about $250,000. A. H. Hogeland of St. Paul, Minn., is chief engineer.

TRENTON, ONT.—The British Chemical Company is planning to rebuild its plant, recently destroyed by fire. The loss is estimated at about $175,000.

WAPELLA, SASK.—The construction of an electric light plant, to cost about $50,000, is under consideration. W. P. McDonald is reported interested in the project.

Miscellaneous

PANAMA.—Bids will be received at the office of the general purchasing officer of the Panama Canal, Washington, D. C., until Nov. 21 for machine-shop equipment, copper, yellow metal, bell metal, solder, tin, electrical supplies and fixtures, etc. Blanks and further information relating to this circular (1238) may be obtained at the above office or the offices of the assistant purchasing agents, 24 State Street, New York City; 606 Common Street, New Orleans, La., and Fort Mason, San Francisco, Cal.

Record of Electrical Patents

Notes on United States Patents

1,279,994. TRANSFORMER; Walter M. Dann, Wilkinsburg, Pa. App. filed Sept. 10, 1915. Means in shell-type transformer for ventilating core members by directing cooling air currents thereupon during operation.

1,279,997. ARRANGEMENT FOR AUTOMATICALLY REGULATING THE ADVANCE OF THE SPARK IN EXPLOSION MOTORS; Auguste Dutreux, Issy les Moulineaux, France. App. filed Dec. 6, 1916. Employment of exciting current of dynamo for controlling advance of spark enables centrifugal speed regulator ordinarily employed to be dispensed with.

1,280,007. PHASE CONVERTING AND BALANCING SYSTEM; Charles Le G. Fortescue, Pittsburgh, Pa. App. filed Sept. 28, 1917. When single-phase circuit is energized from polyphase circuit load is uniformly distributed over the different phases of polyphase circuit.

1,280,016. SANITARY TELEPHONE ATTACHMENT; Gerhardt E. Grimm, Collingswood, N. J. App. filed Jan. 2, 1917. Cannot be accidentally knocked from position, and is provided with removable antiseptic diaphragm.

1,280,018. ELECTRIC SNAP SWITCH; Monroe Guett, Hartford, Conn. App. filed Feb. 27, 1918. Toggle operates roller contact.

1,280,029. ANTI-OVERHEATING DEVICE; John H. Hickey, San Francisco, Cal. App. filed Dec. 13, 1917. Excessive heat from coil of electric iron melts fusible connection and prevents burn-out.

1,280,034. FLASHER; Fred Hotchner, San Francisco, Cal. App. filed Feb. 7, 1917. Can be set up in shop and tested, then dismounted and shipped without disturbing position of leads to fuse blocks within flasher box.

1,280,040. INDUCTION MOTOR; Oliver S. Jennings, Wilkinsburg, Pa. App. filed June 30, 1915. Provides means whereby speed may be varied in simple and economical manner, with but few lead wires.

1,280,052. THERAPEUTIC INSTRUMENT; Tiodolf Lidberg, Chicago, Ill. App. filed Dec. 18, 1916. Has a heat-responsive, current-controlling regulator and a graduated temperature indicator.

1,280,076. MULTIPLE-SWITCH STARTER; Alexander H. Olmsted, Bowden, and Lawrence Boothman, Stratford, England. App. filed Dec. 4, 1913. Each switch mechanically interlocked with next in such manner that switches cannot be closed except in predetermined sequence and will open only in inverse order.

1,280,096. AUTOMATIC-TELEPHONE SYSTEM; Alton E. Stevens, Providence, R. I. App. filed Jan. 17, 1916. Several stations may be electrically united for intercommunication, secrecy is secured, power may be supplied to entire system for communicating and ringing purposes by one common battery, and all stations may be automatically and simultaneously signaled from any station.

1,280,097. AUTOMATIC-TELEPHONE SUBSTATION MECHANISM; Alton E. Stevens, Providence, R. I. App. filed April 21, 1917. To reduce to minimum the manual movements required in making telephone connection to desired station, to compel the operator to use apparatus in way intended.

1,280,098. LOCOMOTIVE; Norman W. Storer, Pittsburgh, Pa. App. filed May 25, 1914. Running gear embodies plurality of driving motors, field-magnet frames of which are rigidly secured between locomotive side frames to constitute permanent cross-ties, and armatures of which are carried in bearing housings which are detachably secured to side frames.

1,280,102. INTERRUPTER AND SPARK ADVANCER FOR INTERNAL-COMBUSTON ENGINES; Auguste Dutreux, Issy les Moulineaux, France. App. filed Dec. 6, 1916. Applicable to all kinds of generators of electricity for ignition purposes or for ignition combined with lighting of vehicles or for starting internal-combustion motors.

1,280,105. ELECTRIC IGNITER; Edmund J. Kane, Chicago, Ill. App. filed Feb. 2, 1910. To reduce wear and hammering of electrical make-and-break contacts and other parts of generator.

1,280,115. CASING FOR PENDENT SWITCHES AND THE LIKE; Charles J. Klein, Milwaukee, Wis. App. filed Aug. 26, 1912. Especially adapted for switch mechanism having a reciprocable operating member.

1,280,116. RAIN ALARM; Louis T. Troiana, Port Washington, N. Y. App. filed Sept. 5, 1917. Pair of contacts spaced slightly apart and adapted to be bridged by adhesion of rain drops therebetween.

1,280,136. RAIN SIGNAL; Henry J. Blackmore, Indianapolis, Ind. App. filed Sept. 5, 1917. Balanced member adapted to receive rain water at one end thereof so that said end will be depressed to close an electric circuit and sound the alarm.

1,280,137. RAIN INDICATOR; Henry J. Blackmore, Indianapolis, Ind. App. filed Aug. 7, 1917. Has means for draining water from water pocket after rainfall and cover-plate for device which in open position acts to increase flow of rain water into receptacle.

1,280,147. COMBINED MOTOR STARTING AND RELEASING MECHANISM FOR ALTERNATING-CURRENT MOTORS; Lynde Bradley and Harry L. Bradley, Milwaukee, Wis. App. filed Aug. 14, 1913. Adapted for use in connection with rheostat in controlling multiphase motors.

1,280,171. SECONDARY-CLOCK MECHANISM; Charles M. Crook, Chicago, Ill. App. filed April 9, 1914. Minute hand locked so that it cannot move except when properly moved forward by clock mechanism.

1,280,172. INSULATOR PROTECTOR; Charles A. Culligan, Penniac, New Brunswick, Canada. App. filed Feb. 16, 1918. To protect mechanically insulators of aërial wires, while at same time insuring complete insulation of conductor to prevent loss of current.

1,280,213. METHOD OF AND APPARATUS FOR ELECTROPLATING; Clarence A. Hach, Oak Park, Ill. App. filed Jan. 12, 1917. Hydrogen bubbles are carried away by air liberated in form of small bubbles directly under article being plated.

1,280,227. SAFETY CUT-OUT FOR INCANDESCENT ELECTRIC LAMPS; Alfred W. Houchin, Kirkwood, N. J. App. filed April 29, 1917. When excessive current is supplied to lamp, circuit is cut out, thereby preventing filament of lamp from injury.

1,280,242. CIRCUIT-CLOSER DEVICE; Rudolph Kotkas, Portland, Ore. App. filed Nov. 20, 1917. For causing an alarm to be sounded should a person step upon floor under which alarm is placed.

1,280,249. METHOD OF AND APPARATUS FOR PLATING; George A. Landry, Chicago, Ill. App. filed Jan. 15, 1917. For controlling amount of metal deposited on different parts of surface of article being plated.

1,280,256. RING-BACK ARRANGEMENT FOR TELEPHONE PARTY LINES; Fritz Lubberger, Chicago, Ill. App. filed Sept. 19, 1907. Relates to automatic or semi-automatic telephone-exchange systems in which plurality of subscribers' stations are located on one and the same line.

1,280,258. CALL-INDICATING SYSTEM; Alben E. Lundell, New York, N. Y. App. filed Nov. 1, 1916. Means for informing final connecting operator of the number of wanted line by means of visual signals.

1,280,290. ELECTRICAL HEATER FOR CARBURETORS; Thorwald B. Peterson, Omaha, Neb. App. filed Oct. 7, 1916. Readily attachable to bowl or float chamber of ordinary carburetor to heat quickly to boiling temperature oil contained in chamber, thereby facilitating starting engine in cold weather.

1,280,300. FLASHLIGHT CASE; Adolph C. Recker, Oakville, Conn. App. filed March 6, 1918. Removable cap applied to inner end of case furnished with a glazed receptacle for reception of a game, photograph, compass, etc.

1,280,324. AUTOMATIC TELEPHONE-EXCHANGE SYSTEM; Arthur B. Sperry, New York, N. Y. App. filed Nov. 26, 1917. Relates to trunking systems, and more particularly to two-way two-wire trunks.

1,280,370. ELECTRIC POCKET LAMP; Josef Beckmann, Frankfort-on-the-Main, Germany. App. filed Nov. 10, 1915. Light can be shaded or directed downward, so that it can be used to light the way or a map, etc., at same time preventing owner from being discovered.

1,280,374. PENCIL-LIGHTING ATTACHMENT; Jerrell Bennett, Grapeville, Tex. App. filed March 23, 1917. Bulb is made to encircle pen, pencil or brush while pocket clip connects and disconnects battery and light.

1,280,380. FLASHLIGHT; Lester W. Borchert, Cleveland, Ohio. App. filed Jan. 26, 1918. Flat or boat-like member containing electric lamps and batteries and with transparent top portion through which light may pass in all directions for use at sea when launching lifeboats from a vessel to illuminate vicinity of vessel.

1,280,395. UNIVERSAL CORD CIRCUITS; Alva J. Carter, Chicago, Ill. App. filed June 6, 1914. Relates to telephone systems, in which universal cord circuits are provided for interconnecting telephone lines of different characters such as magneto and common-battery lines.

1,280,406. SHIP'S NAVIGATING APPARATUS; Edward W. Couchois, Mackinac Island, Mich. App. filed Dec. 29, 1916. Distance traveled by and course of ship is recorded and apparatus is under control of compass.

1,280,423. SYNCHRONIZING SYSTEM; Amos Frederick, Newark, N. J. App. filed Nov. 2, 1914. Synchronism in multiplex telegraphy normally obtained by signal current reversals can be automatically maintained during non-signaling intervals.

1,280,431. FUSE-CLIP ATTACHMENT; Alfred L. Eustice, Chicago, Ill. App. filed Sept. 9, 1914. Positive means for securing contact in preference to dependence upon resiliency of metal clips.

1,280,457. HAND SWITCH FOR AUTOMOBILES; Archer H. Harris, Barberton, Ohio. App filed Oct. 18, 1916. Headlights may be turned off or on by thumb of hand that switch is carried on.

1,280,471. METHOD OF APPARATUS FOR TREATING GASES AND VAPORS ELECTRICALLY; William T. Hoofnagle. Glen Ridge, N. J. App. filed Nov. 23, 1917. Intended particularly for treatment of air in production of nitrogen oxides.

1,280,478. ELECTRICAL FUSE; Bryson Horton, Detroit, Mich. App. filed June 9, 1914. Time taken for fuses to blow under overload conditions is determinate within close limits.

1,280,479. COMBINED ENTRANCE SWITCH AND SERVICE BOX; Bryson D. Horton, Detroit, Mich. App. filed Aug. 18, 1914. To insure proper metering and distribution of current without possibility of theft, by compact apparatus.

1,280,522. COMBINED CIRCUIT BREAKER AND ALARM SWITCH; Gertrude B. Nixon, Bryn Mawr, and Harold L. Morris, Wayne, Pa. App. filed Jan. 8, 1918. Stops current flow in overheated appliance and rings alarm giving notice that attention is required.

1,280,547. ELECTRIC SWITCH; Arthur E. Read, New York, N. Y. App. filed July 21, 1917. Of one-push-button type; electrical contact is made and broken instantaneously with snap which obviates sparking and injury to terminals.

1,280,556. TELEPHONIC APPARATUS; Louis Scher, New York, N. Y. App. filed Nov. 7, 1916. Loud-speaking portable device which will enable persons with impaired hearing to use ordinary telephone.

1,280,560. DEVICE FOR TREATING GOITERS; Henry L. Scholl, Watertown, Wis. App. filed Feb. 23, 1918. Ornamental necklace, chain, band, etc., generates voltaic currents in presence of mercurous iodide and calcium chloride, a saline or acid solution.

1,280,564. PROTECTIVE SWITCH FOR ELECTRIC FLATIRONS; Samuel B. Shapiro, Newburgh, N. Y. App. filed Sept. 11, 1917. Will automatically cut off current when handle of iron or other devices is released by operator.

1,280,566. APPARATUS FOR TRANSMITTING MESSAGES; John J. Sherry and John L. Du Frane, Oakland, Cal. App. filed Oct. 3, 1917. Repeats telegraphic or wireless message indefinitely after apparatus is set without human attention.

1,280,570. TELEGRAPH OR LIKE SYSTEM; Sidney R. Smith, Liverpool, England. App. filed Feb. 7, 1916. Relates particularly to signal storing and transmitting apparatus for use, for example, in keyboard printing-telegraph systems.

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